55-1520-237-23-5

TM 55-1520-237-23-5

TECHNICAL MANUAL

AVIATION UNIT AND INTERMEDIATE MAINTENANCE
FOR
ARMY
UH-60A AND EH-60A HELICOPTERS

CHAPTER 11
FLIGHT CONTROLS SYSTEM

CHAPTER 12
UTILITY SYSTEM

CHAPTER 13
ENVIRONMENTAL CONTROL SYSTEMS

CHAPTER 14
HOISTS AND WINCHES

CHAPTER 15
AUXILIARY POWER PLANT SYSTEM

This copy is a reprint which includes current pages from Change 1.

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This TM supersedes TM 55-1520-237-23-1, dated 15 November 1988, TM 55-1520-237-23-2, TM 55-1520-237-23-4, TM 55-1520-237-23-5, TM 55-1520-237-23-6, TM 55-1520-237-23-7, TM 55-1520-237-23-8, TM 55-1520-237-23-9, TM 55-1520-237-23-10, dated 29 December 1978, and TM 55-1520-237-23-11, dated 13 May 1985.

HEADQUARTERS, DEPARTMENT OF THE ARMY
29 AUGUST 1989

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D 101. 11:

CHANGE
NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 22 November 1989

Aviation Unit and Aviation Intermediate Maintenance Manual

FOR

ARMY UH-60A, EH-60A AND UH-60L HELICOPTERS

TM 55-1520-237-23-5, 29 August 1989, is changed as follows:

1. Title has been changed to read as stated above.

2. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature hand.

Remove pages	Insert pages
11-19 and 11-20	11-19 and 11-20
11-49 and 11-50	11-49 and 11-50
11-97 through 11-102	11-97 through 11-102
11-113 and 11-114	11-113 and 11-114
11-161 and 11-162	11-161 and 11-162
- - - -	11-162.1/11-162.2
11-163 through 11-182	11-163 through 11-182
- - - -	11-182.1 through 11-182.4
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11-239 and 11-240	11-239 and 11-240
- - - -	11-240.1/11-240.2
11-241 and 11-242	11-241 and 11-242
11-261 and 11-262	11-261 and 11-262
- - - -	11-262.1/11-262.2
11-287 and 11-288	11-287 and 11-288
11-353 and 11-354	11-353 and 11-354
11-365 and 11-366	11-365 and 11-366
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12-11 and 12-12	12-11 and 12-12
12-51 through 12-60	12-51 through 12-60
12-113 and 12-114	12-113 and 12-114
12-119 through 12-130	12-119 through 12-130
- - - -	12-130.1/12-130.2
12-131 through 12-146	12-131 through 12-146
15-1 through 15-4	15-1 through 15-4
15-17 and 15-18	15-17 and 15-18
15-27 and 15-28	15-27 and 15-28

3. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

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To be distributed in accordance with DA Form 12-31, AVUM and AVIM Maintenance requirements for EH-60A Helicopter, Electronic Countermeasure, and UH-60A Helicopter, Utility (BLACKHAWK).

CHAPTER 11

FLIGHT CONTROLS SYSTEM

CHAPTER OVERVIEW

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11-1 FLIGHT CONTROL SYSTEM 11-1

PARAGRAPH BREAKDOWN

11-1.1	INSPECT SELF-RETAINING BOLTS
11-1.2	INSPECT BEARING FRICTION AND WEAR
11-1.3	INSPECT CONTROL ROD CONNECTIONS
11-1.4	CONTROL ROD INSTALLATION

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Spring Scale, AAA-S133

REFERENCES

- PARA 1-6.3
- PARA 11-4
- PARA 11-6
- PARA 11-8
- PARA 11-17
- PARA 11-23
- PARA 11-27
- PARA 11-28

11-1.1 INSPECT SELF-RETAINING BOLTS 11-1.1

WARNING

FLIGHT SAFETY PARTS

The outside diameter and bolthead shoulder of the self-retaining bolts are critical surfaces which must not be damaged.

NOTE

Two types of self-retaining bolts are used in the flight control system. Impedance type self-retaining bolts that have a retaining ring, and ball-type self-retaining bolts.

a. Impedance bolts must have retaining ring intact. When installing bolt, retaining ring must provide resistance when going into bolthole.

b. For ball-type bolts, make sure retaining balls cannot be pushed in without first depressing button in center of bolthead.

c. Self-retaining bolts may be reused provided bolt shows no sign of corrosion, fretting, nicks, or damaged threads, and retaining mechanism is not damaged.

11-1.2 INSPECT BEARING FRICTION AND WEAR 11-1.2

a. Disconnect both engine collective load demand cables from mixer levers (PARA 11-17).

b. Disconnect tail rotor quadrant spring cylinders (PARA 11-28).

c. Apply external power, or run APU (PARA 1-6.3).

d. Turn on backup hydraulic pump.

e. Loosen collective friction nut.

f. Place spring scale, on collective grip. Measure and record force necessary to just start collective stick moving.

g. Place collective stick in mid- to high position.

h. Place cyclic stick in midposition.

i. With spring scale on cyclic grip, measure and record force necessary to just start cyclic moving left, right, front, and back.

j. Place spring scale on left, then right pedal. Measure and record force necessary to just start pedal moving.

k. Compare recorded forces with Table 11-1.

Table 11-1

Channel	Position	Maximum Forces In Ounces
Lateral	Push right	12.5
	Push left	9.5
Longitudinal	Push forward	15
	Push back	15.1
Directional	Left and right	64.5
Collective	Up and down	60.5

l. If any channel measures more than Table 11-1 force values, do this:

(1) Turn off hydraulic pump.

(2) Disconnect collective pitch, roll and yaw torque shaft outputs to the pilot assist servos (PARA 11-27). Leave yaw and roll trim actuators connected. Push TRIM button off.

(3) Place spring scale, on collective stick grip, cyclic stick grip, and yaw pedals.

(4) Measure and record force necessary to just move each control, as done with hydraulic power on.

(5) Compare recorded forces with Table 11-2.

Table 11-2

Channel	Position	Maximum Forces In Ounces
Lateral	Push right	6.5
	Push left	6.5
Longitudinal	Push forward	6.5
	Push back	5.0
Directional	Left and right	32.5
Collective	Up and down	60.5

m. If the maximum forces of Table 11-2 are exceeded, check each bearing in system from torque shafts to cockpit controls for cracks, displacement, seal damage, or binding. Replace any part having bearings that are cracked, loose, displaced, or binding (PARAS 11-4, 11-6, 11-8, 11-27).

11-1.2 INSPECT BEARING FRICTION AND WEAR 11-1.2

n. If more force than limits shown in Table 11-2 is needed, but not more than limits shown in Table 11-1, check each bearing in system from pilot-assist servos to main rotor spindles and tail rotor servo quadrant. Replace or repair parts having binding, cracked, loose, or displaced bearings.

o. Connect overhead torque shaft outputs to pilot-assist servos (PARA 11-27).

p. Connect engine collective load demand cables to mixer levers (PARA 11-17).

q. Connect tail rotor quadrant spring cylinders to pylon fittings (PARA 11-28).

CAUTION

To prevent damage to control rods, servos, etc., use no force greater than light hand pressure to move controls with hydraulic power off.

r. Check system free play at each control (cyclic, collective, and yaw pedals) with hydraulic pressure off.

s. If there is more than 1/8-inch total free play, check each bearing in system for play. Replace bearing(s) that have most play (PARAS 11-6, 11-8, and 11-4), and then recheck system for 1/8-inch free play.

11-1.3 INSPECT CONTROL ROD CONNECTIONS 11-1.3

a. Check for free rotation of long bushing using finger force, and for a clearance of 0.002 - 0.125 inch between control rod long bushing flange and control rod clevis.

   (1) **IF BUSHING CANNOT BE ROTATED AND CLEARANCE IS LESS THAN 0.002 INCH, REPLACE BUSHING WITH A LONGER BUSHING.**

   (2) **IF BUSHING CAN BE ROTATED AND CLEARANCE IS MORE THAN 0.125 INCH, REPLACE BUSHING WITH A SHORTER BUSHING.**

b. Check for no rotation of short clamp up bushings and for a clearance of 0.002 - 0.125 inch between washers and control rod clevis on each side.

   (1) **IF BUSHINGS CAN BE ROTATED AND CLEARANCE IS LESS THAN 0.002 INCH ON EACH SIDE, REPLACE BUSHINGS WITH LONGER BUSHINGS.**

   (2) **IF BUSHINGS CAN BE ROTATED AND CLEARANCE IS 0.002 - 0.125 INCH, RETORQUE NUTS; THEN RECHECK FOR NO ROTATION OF BUSHINGS AND FOR A CLEARANCE OF 0.002 - 0.125 INCH.**

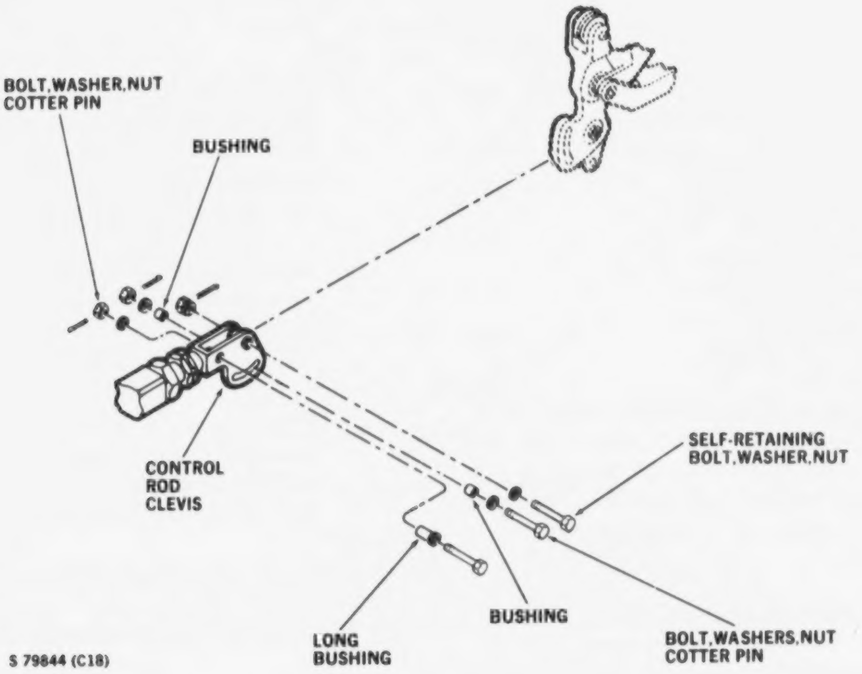

BOLT,WASHER,NUT
COTTER PIN
BUSHING
CONTROL ROD CLEVIS
SELF-RETAINING BOLT,WASHER,NUT
LONG BUSHING
BUSHING
BOLT,WASHERS,NUT COTTER PIN
S 79844 (C18)

FIGURE 11-1

11-1.3 INSPECT CONTROL ROD CONNECTIONS 11-1.3

(3) **IF BUSHINGS CANNOT BE ROTATED AND CLEARANCE IS MORE THAN 0.125 INCH, REPLACE BUSHINGS WITH SHORTER BUSHINGS.**

c. Where a rubbing or wearing condition exists between short clamp up bushings and control rod clevis slot, a maximum of 0.015 inch material removal is allowed.

d. Where control rod clevis holes are elongated by long bushings contact, a maximum elongation of 0.015 inch is allowed.

11-1.4 CONTROL ROD INSTALLATION 11-1.4

Table 11-3

Washer Thickness (Inch)	Quantity
0.016	3
or	
0.016	2
or	
0.063	1
or	
0.016	1
0.063	1
or	
0.016	2
0.C63	1

NOTE

- A maximum of three washers, only in thickness combinations indicated in table, can be installed under bolthead so correct nut torque, self-retaining features, and cotter pin installation can be obtained.
- If more than three washers are required to obtain the correct nut torque, self-retaining features, and cotter pin installation the substitution of a shorter or longer bolt of the same part number, but with a different dash number is allowed.

a. Refer to Table 11-3 for proper washer stackup on bolt.

b. Install self-retaining bolt and washers (under head).

c. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedance feature is depressed, change washer stackup using Table 11-3, or use next longer or shorter bolt.

d. Install nut on bolt. Torque nut to value shown in task, and install cotter pin.

NOTE

If unable to torque bolthead, use a crowfoot attachment to torque nut, without disturbing cotter pin, and without restraining bolthead.

e. Proof torque bolthead to value shown in task. If bolt rotates, adjust using washers in Table 11-3, or use next longer or shorter bolt.

11-2 FLIGHT CONTROL SYSTEM - RIG AND ADJUST 11-2

PARAGRAPH BREAKDOWN

11-2.1 INTRODUCTION

11-2.2 RIG/CHECK OF MAIN ROTOR

11-2.3 RIG/CHECK OF TAIL ROTOR

11-2.4 RIGGING TAIL ROTOR

11-2.5 ADJUST CYCLIC STICK BALANCE SPRING

11-2.6 ADJUST COLLECTIVE STICK BALANCE SPRING

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Cotter Pin, MS24665-300
- Tiedown Straps, Item 370, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Drill Set, 666-D-751
- Protractor, F7710
- Rigging Kit, 70700-20390-042
- Tensiometer, MIL-T-38760
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- PARA 2-32
- PARA 4-10
- PARA 5-18
- PARA 7-2
- PARA 7-6
- PARA 11-5
- PARA 11-19
- PARA 11-21
- PARA 11-27
- PARA 11-28
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-2.1 INTRODUCTION 11-2.1

a. Rigging the UH60A flight control system consists of coordinating the pilot's stick and pedal movements, in the cockpit, with the correct blade angles at the main and tail rotors.

b. Rigging shall be done by qualified mechanics who are familiar with the helicopter and the flight control system.

c. Rigging main rotor should be done with blades installed.

d. A main rotor rig/check is required whenever a main gear box, rotor head, boost servo or any flight control component is replaced. See PARA 11-19 for rigging requirements when replacing primary servos. Fixed length pushrods, bellcranks, and idlers are interchangeable without a rigging check. Adjustable length rods and the fixed pitch bias actuator (if installed) may be changed without a rigging check, provided replacement is trammeled to the exact length (set to dimension measured pivot bolt-hole to pivot bolt-hole). Whenever possible, the controls should be pinned immediately fore and aft of the component being replaced. Any work done on longitudinal and collective requires a recheck of yaw system due to the coupling in the mixer.

e. The following procedures are examples of how to use the propeller protractor to read or check main rotor blade angles:

ZERO PROTRACTOR

(1) Hinge corner spirit level out to right angles with frame. For accurate readings keep bubble centered during all adjustments.

(2) Line up vernier zero with degree scale zero and set disc-to-ring lock. This locks ring to disc.

(3) Loosen ring-to-frame lock so ring can be turned in frame by ring adjustor.

(4) Set protractor bottom edge on sleeve boss (Figure 11-3, Sheet 1, Details A and B).

NOTE

Protractor must be held on sleeve boss in the same position it will be in when checking blade angles on blade cuff (Figure 11-3, Sheet 2, Detail C).

(5) Hold protractor firmly on boss and hold vertical. Check corner spirit level bubble.

MEASURE BLADE ANGLE

(6) Turn ring adjustor until center spirit level bubble centers in spirit level. Tighten ring-to-frame lock.

(7) Pull disc-to-ring lock and turn it one-quarter turn to keep it out.

(8) Place protractor on blade cuff next to expandable pins (Figure 11-3, Sheet 2, Detail C and D).

NOTE

Be sure edge of protractor is not setting on washers under expandable pins.

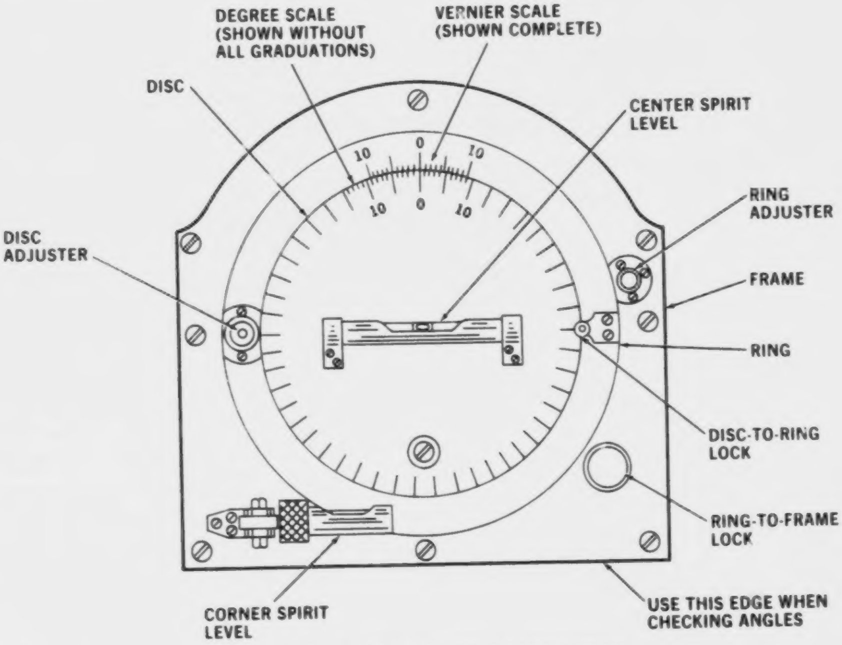
(9) Turn disc adjustor so center spirit level is level again (bubble centered).

(10) Read blade angle on propeller protractor.

(11) Rotor head and swashplate are not level in any rigging position; blade angles must be average readings.

(12) For collective ranges, place collective stick in full low pitch (rigging pin in pedals and tool on yaw boost servo) and cyclic stick pinned (fore-and-aft, and lateral).

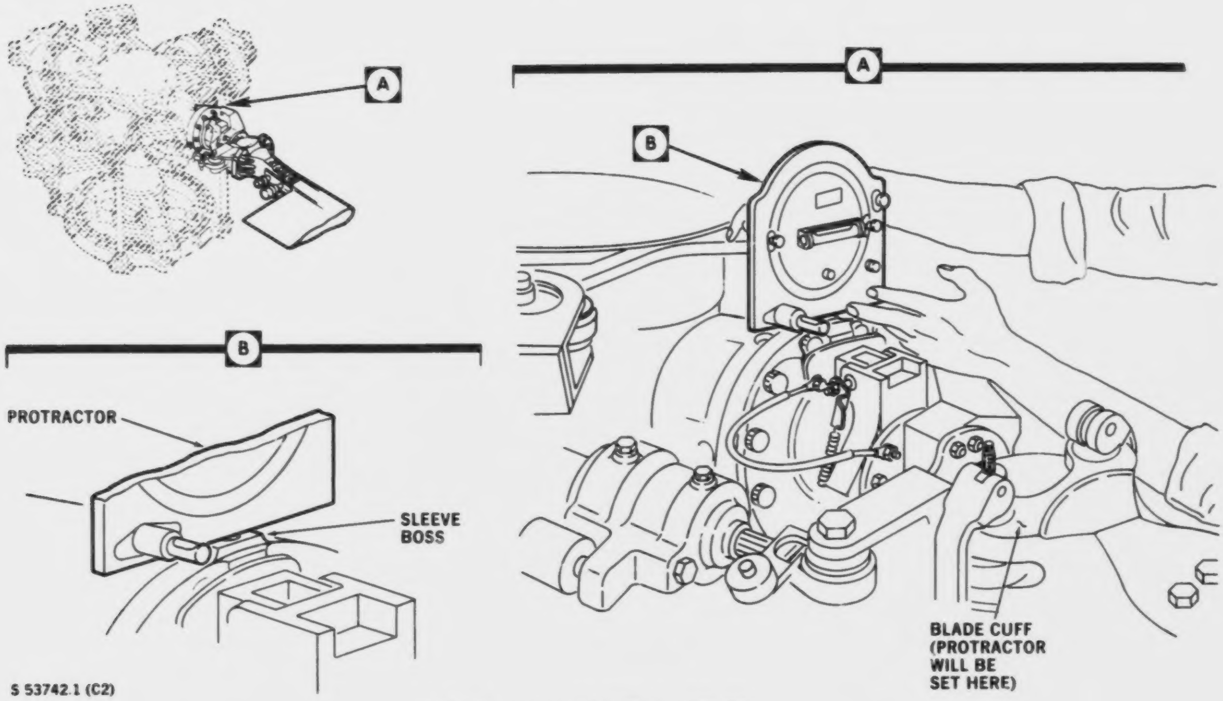
11-2.1 INTRODUCTION 11-2.1


DEGREE SCALE (SHOWN WITHOUT ALL GRADUATIONS)
VERNIER SCALE (SHOWN COMPLETE)
DISC
CENTER SPIRIT LEVEL
10
0
10
10
0
10
RING ADJUSTER
DISC ADJUSTER
FRAME
RING
DISC-TO-RING LOCK
RING-TO-FRAME LOCK
CORNER SPIRIT LEVEL
USE THIS EDGE WHEN CHECKING ANGLES

S 53741 (C2)

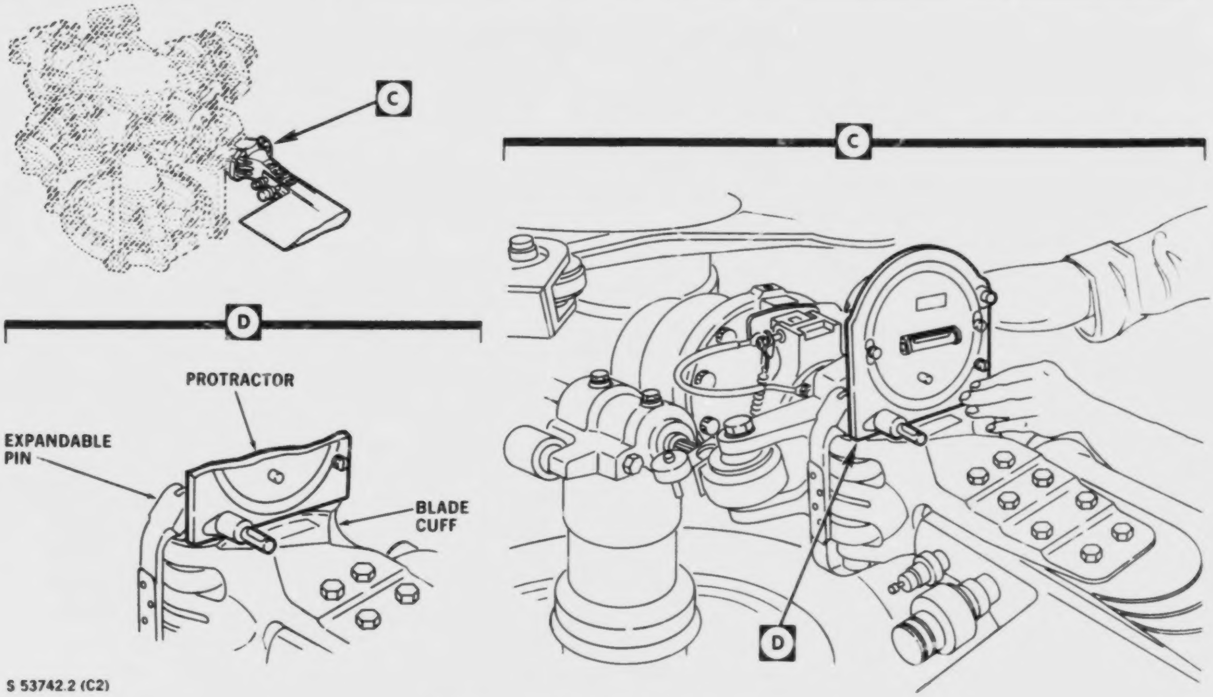
UNIVERSAL PROPELLER PROTRACTOR

FIGURE 11-2


A
A
B
B
PROTRACTOR
SLEEVE BOSS
BLADE CUFF (PROTRACTOR WILL BE SET HERE)

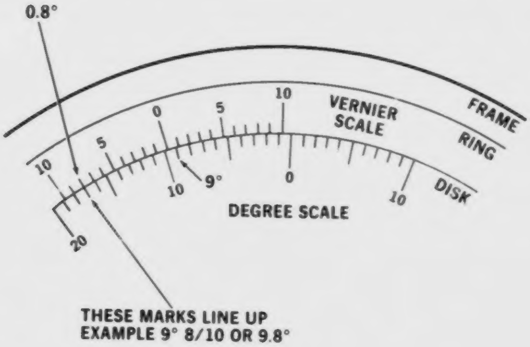
S 53742.1 (C2)

FIGURE 11-3 (SHEET 1 OF 2)


C
C
D
PROTRACTOR
EXPANDABLE PIN
BLADE CUFF
D

S 53742.2 (C2)

FIGURE 11-3 (SHEET 2 OF 2)


0.8°
10
0
5
10
VERNIER SCALE
FRAME
RING
DISK
10
5
10
9°
0
10
DEGREE SCALE
20

THESE MARKS LINE UP
EXAMPLE 9° 8/10 OR 9.8°

VERNIER ZERO IS TO LEFT OF 9° MARK.
ALWAYS READ TENTHS OF A DEGREE
ON VERNIER SCALE IN SAME DIRECTION
AS THE DEGREES ARE READ ON DEGREE SCALE.

S 53743 (C9)

READING BLADE ANGLES

FIGURE 11-4

11-2.1 INTRODUCTION 11-2.1

NOTE

Protractor must be zeroed out on top of main rotor sleeve boss in line with each blade location for each reading.

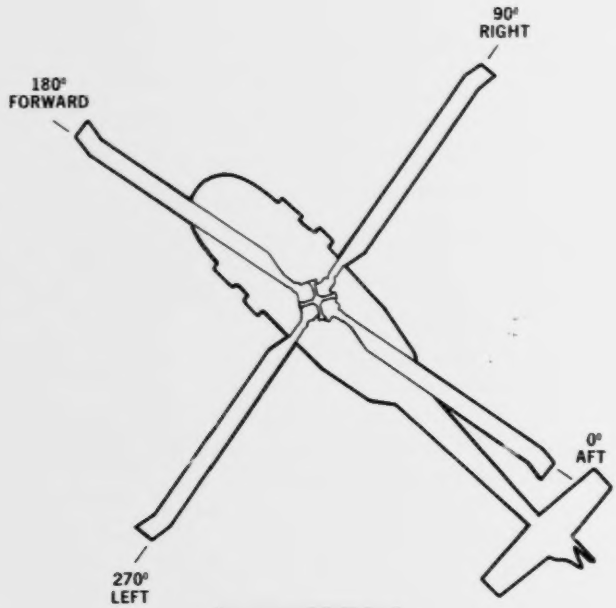
(13) Move any blade to 90° position (turning push rod over forward logitudinal input, and black marks on swashplate lined up). Check and record blade angle. Turn rotor head and repeat readings on same blade at all four control positions. Add four readings and divide by 4. This is low collective angle.

Example

0°	90°	180°	270°
+1.9°	+12.2°	−1.1°	−9.5°

Add +1.9° and +12.2° = +14.1°
Add −1.1° and −9.5° = −10.6°
Subtract −10.6° from 14.1° = +3.5°
Divide +3.5° = 0.87° average angle
By 4

(14) For high pitch, move collective pitch stick to high pitch position. Lock in place and repeat above procedure.



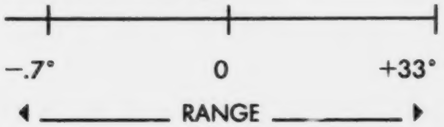
BLADE POSITIONS VIEW LOOKING DOWN

FIGURE 11-5

(15) For longitudinal (pitch) ranges, average two readings taken on same blade in 90° and 270° positions.

Examples

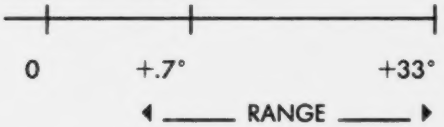
1. Protractor Reading



Average is 33° Plus .7° divided by 2

$$\frac{33^\circ + .7^\circ}{2} = \frac{33.7}{2} = 16.85$$

2. Protractor Reading



Average is 33° minus -.7° divided by 2

$$\frac{33^\circ - .7^\circ}{2} = \frac{32.3}{2} = 16.15$$

(16) For lateral (roll) ranges, average two readings taken on same blade in 180° and 0° locations.

f. When taking readings, make sure copilot's collective stick is extended. Have assistant hold light pressure on controls to eliminate lost motion as follows:

	Direction of Pressure		
Reading	**Cyclic**	**Pedals**	**Collective**
Low Collective	Aft, Left	Left	Down
High Collective	Aft, Left	Left	Up
High Forward	Fwd, Left	Left	Up
High Aft	Aft, Left	Left	Up
Right Lateral	Aft, Right	Left	Down
Left Lateral	Aft, Left	Left	Down

g. Difference between blade cuff and hub attaching surface (where blade angle is measured) is 9°. Therefore, it is possible for blade to be negative and still read a positive angle at the attaching surface. All calculations are made using the angle measured at hub attaching surface.

NOTE

The backup pump should be used only as an alternate source to power the hydraulic systems. External hydraulic power should be applied whenever available.

h. Rigging kit, 70700-20389-042, consists of rigging pins, and rigging blocks, as listed in Table 4.

11-2.1 INTRODUCTION 11-2.1

Table 11-4

Pin Part No.	Location	Inch Dia	Inch Length	No. Needed
70700-20380-065	PITCH CYCLIC STICKS	1/4	4	2
70700-20380-066	ROLL CYCLIC STICKS	1/4	4	2
70700-20380-042	YAW PEDAL ADJUSTOR	5/16	6	2
70700-20380-043	TORQUE SHAFTS	5/16	4	4
70700-20380-044	PITCH/ROLL ASSYS	5/16	1.5	2
70700-20380-046	MIXER R/H	5/16	36	1
70700-20380-068	MIXER L/H YAW	5/16	12	1
70700-20342-041	SWASHPLATE BELLCRANK	7/8	7.5	2
70700-20342-042	SWASHPLATE BELLCRANK	1/2	7	1
70700-20380-071	TAIL ROTOR SERVO	1/4	6	1
70700-20378-103	DAMPER BLOCKS	-	-	4
70700-20380-062	YAW SERVO	Pin	-	1
70700-20380-062	COLLECTIVE SERVO	Pin	-	1

NOTE

If there is any question on how to install the attaching hardware when connecting control rods, links, and levers, refer to PARA 11-27.

11-2.2 RIG/CHECK OF MAIN ROTOR 11-2.2

CHECK MAIN ROTOR RIG

a. Remove main rotor pylon sliding cover.

b. Remove work platform on mixer.

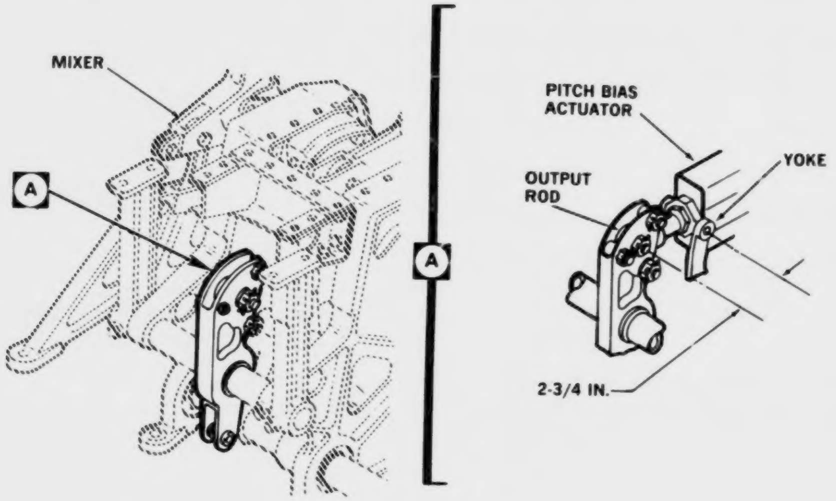
c. Remove pilot's and copilot's cyclic and collective stick boots (PARA 11-5).

d. Check to be sure pitch bias actuator if installed is at midstroke (2-3/4 inches from center of yoke to center of output rod end). If pitch bias actuator is not at midstroke, remove it, and install yaw/pitch coupling link.

NOTE

The backup pump should be used only as an alternate source to power the hydraulic systems. External hydraulic power should be applied whenever available.

e. If using external hydraulic power, on DC ESNTL BUS, pull BACKUP HYD CNTL circuit breaker.



EFFECTIVITY
HELICOPTERS PRIOR TO SERIAL NO. 84-23981

S 45467.5

MEASURING PITCH BIAS ACTUATOR FOR NEUTRAL POSITION

FIGURE 11-6

NOTE

- BOOST-ON, SAS-OFF procedures must be followed anytime hydraulic power is turned on to measure blade angles.
- If aircraft electrical power is unavailable for use, an alternate method to achieve (Hydraulic) BOOST-ON, SAS-OFF is to apply 28 Volt DC to pin 1 and to ground pin 2 on the pilot assist module side of connector, P468R.

f. To do BOOST-ON, SAS-OFF procedures, do this:

(1) Turn on electrical and hydraulic power.

(2) Turn-off BOOST switch and both SAS 1 and SAS 2 switches on AFCS control panel.

(3) Verify that BOOST SERVO OFF and SAS OFF capsules on, are on caution/advisory panel.

(4) Turn off electrical power.

(5) Remove BOOST SHUT-OFF valve electrical connector P469R located on top of pilot assist module.

(6) Turn on electrical power.

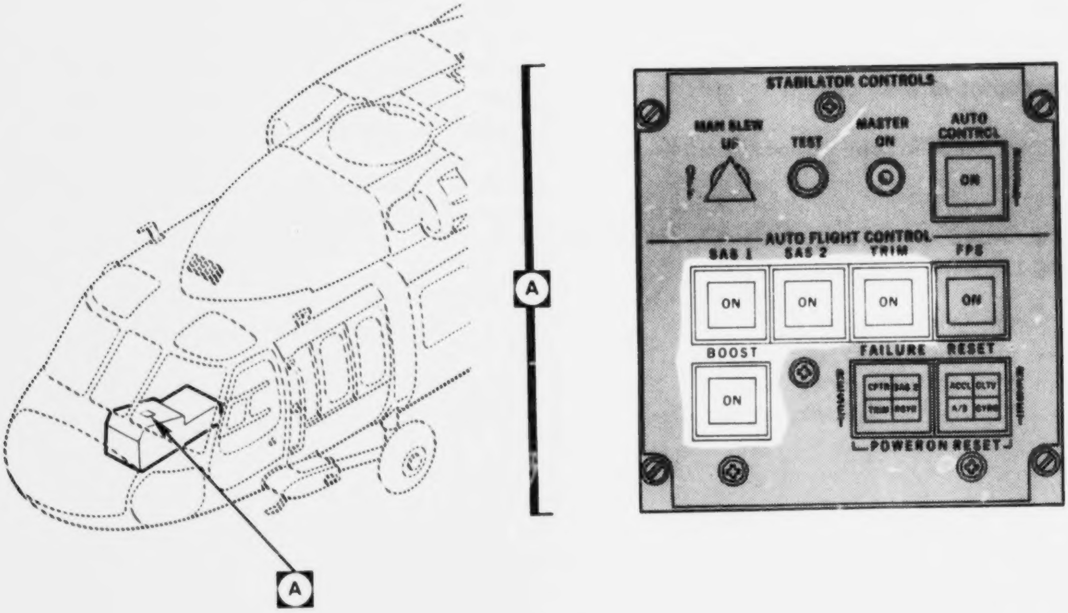
(7) Verify that SAS OFF capsule is on and BOOST SERVO OFF capsule is off - Both located on caution/advisory panel.

NOTE

The three, large rigging pins (70700-20342-041 and 70700-20342-042) are not to be used when rigging the UH-60A.

CAUTION

Do not move controls while installing rigging pins. If rigging holes do not line up, remove pin completely, then move controls or adjust control rods to line up rigging holes.


A
A
STABILATOR CONTROLS
MAN SLEW
UP
TEST
MASTER
ON
AUTO
CONTROL
ON
AUTO FLIGHT CONTROL
SAS 1
SAS 2
TRIM
FPS
ON
ON
ON
ON
BOOST
ON
FAILURE
RESET
CPTR
SAS 2
TRIM
DGVE
ACCL
CLTV
A/S
SYNC
POWERON RESET

S 151186 (BH4)

FIGURE 11-7

CHECK CABIN RODS

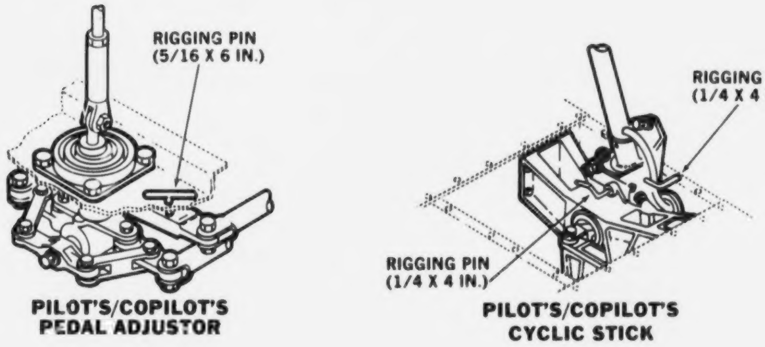
g. Install rigging pin, 70700-20380-042 (5/16 x 6 in.), in pilot's and copilot's pedal adjustors.

h. Install rigging pin, 70700-20380-065 (1/4 x 4 in.), in pilot's and copilot's cyclic stick fore-and-aft (pitch) direction.

i. Install rigging pin, 70700-20380-066 (1/4 x 4 in.), in pilot's and copilot's cyclic stick lateral (roll) direction.

j. Disconnect load-demand rotary inputs from engine hydromechanical unit (PARA 4-10). Install 0.125-inch-diameter drill rods to hold springs compressed.

k. Disconnect engine LDS cables from mixer levers.



PILOT'S/COPILOT'S PEDAL ADJUSTOR

PILOT'S/COPILOT'S CYCLIC STICK

S 53746 (C2)

FIGURE 11-8

l. Check copilot's low collective stopbolt adjustment (Figure 11-9), as follows:

  (1) Measure distance from top of bolthead to flat portion of support above spotface. **MEASUREMENT MUST BE 0.630 - 0.670 INCH.**

  (2) With pilot's collective stick in full down position (against low stop bolt), check gap between copilot's collective stick and stopbolt. **GAP MUST BE 0.010 - 0.030 INCH.**

  (3) Check distance between floor and center bottom edge of pilot's and copilot's collective stick grips (Figure 11-9). **DISTANCE MUST BE WITHIN ± 1/16 INCH.**

m. If stopbolt measurement gap on copilot's collective stick, or stick distance, is not correct, do this:

  (1) Disconnect pilot's and copilot's collective control rods from bellcranks (PARA 11-27).

  (2) Loosen jamnut on copilot's low pitch stopbolt and adjust stopbolt to dimension shown in (Figure 11-9, Detail B). **TIGHTEN JAMNUT 1/6 - 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.** Lockwire, Item 199, Appendix D, jamnut.

  (3) Insert a 0.020-inch feeler gage between copilot's collective stick and low stopbolt. Bottom collective stick.

  (4) Measure distance from copilot's floor to center of collective stick grip (Figure 11-9).

  (5) If measurement taken from copilot's collective stick is not the same for pilot's collective stick, loosen jamnut on pilot's low collective stopbolt and adjust height of pilot's collective stick. **TIGHTEN JAMNUT ON BOLT 1/6 - 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.** Lockwire, Item 199, Appendix D, jamnut.

n. Connect pilot's and copilot's collective control rods to bellcranks (PARA 11-27).

o. Install four pins, 70700-20380-043, (5/16 x 4 in.) in pitch, roll, yaw, and collective upper torque shafts (forward of boost servos).

p. If pins will not go into pitch, roll, or yaw torque shafts, do this:

  (1) Adjust cabin overhead control rods until rigging pins will freely slide in and out of rigging holes in torque shafts.

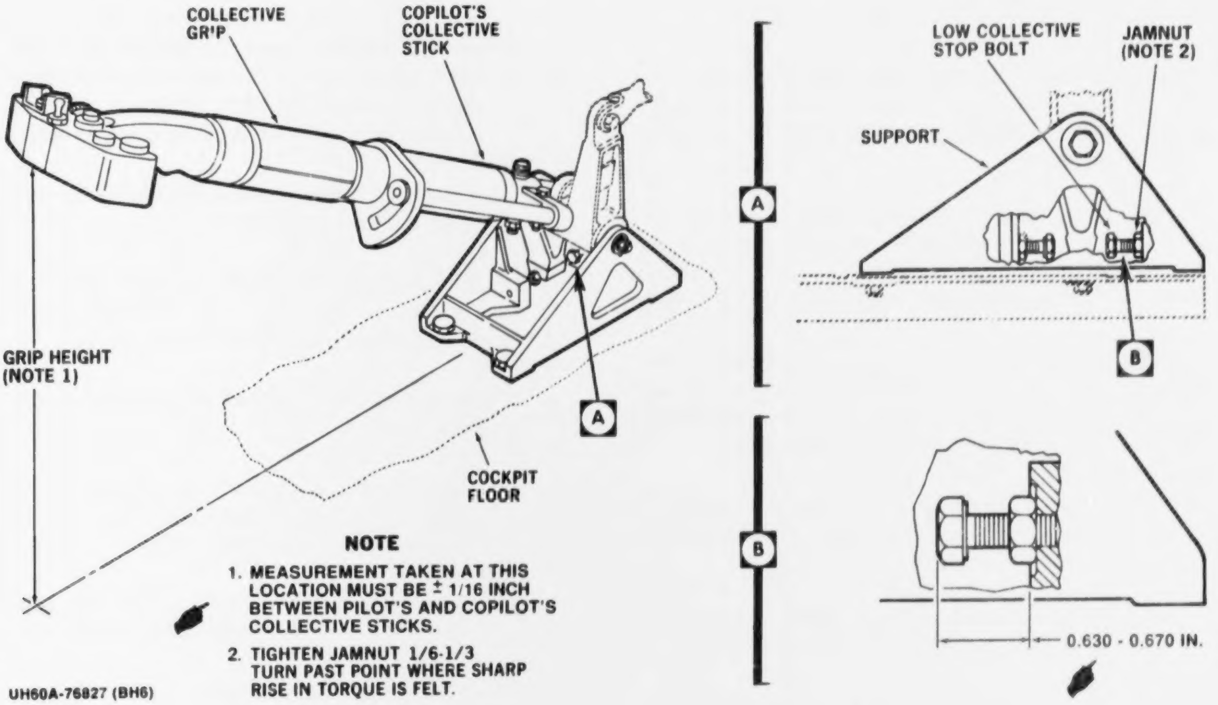
  (2) Check that 0.020-inch wire will not pass through inspection hole in rod end.

  (3) If 0.020-inch wire will pass through inspection hole, shorten rod until wire will not pass through, and adjust vertical control rods until rigging pin will slide freely in and out of rigging hole in torque shaft.

q. If pin will not go into collective torque shaft, do this:

  (1) Check that collective boost servo is bottomed (input clevis resting against servo housing).

  (2) Adjust collective control rod until clevis is against servo housing and torque tube rigging pin fits.


COLLECTIVE GRIP
COPILOT'S COLLECTIVE STICK
GRIP HEIGHT (NOTE 1)
A
COCKPIT FLOOR
LOW COLLECTIVE STOP BOLT
JAMNUT (NOTE 2)
SUPPORT
A
B
B
0.630 - 0.670 IN.
UH60A-76827 (BH6)

NOTE

1. MEASUREMENT TAKEN AT THIS LOCATION MUST BE ± 1/16 INCH BETWEEN PILOT'S AND COPILOT'S COLLECTIVE STICKS.
2. TIGHTEN JAMNUT 1/6-1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.

FIGURE 11-9

(3) Check that pilot's collective stick is against low stopbolt.

(4) Adjust cabin control rods until pilot's collective stick is against low pitch stopbolt, and copilot's collective stick has 0.010- to 0.030-inch gap between stick and stopbolt.

r. Install rigging pin (70700-20380-062) in yaw boost servo. If tool does not go in, adjust yaw control rod (Figure 11-10).

NOTE

There are two holes in pitch/trim assembly housing. Use rear hole for rigging pin installation.

s. Install rigging pins, 70700-20380-044, (5/16 x 1-1/2 in.) in pitch/trim assembly and roll actuator. If rigging pins do not go in, adjust pitch control rod or roll control rod.

11-2.2 RIG/CHECK OF MAIN ROTOR 11-2.2

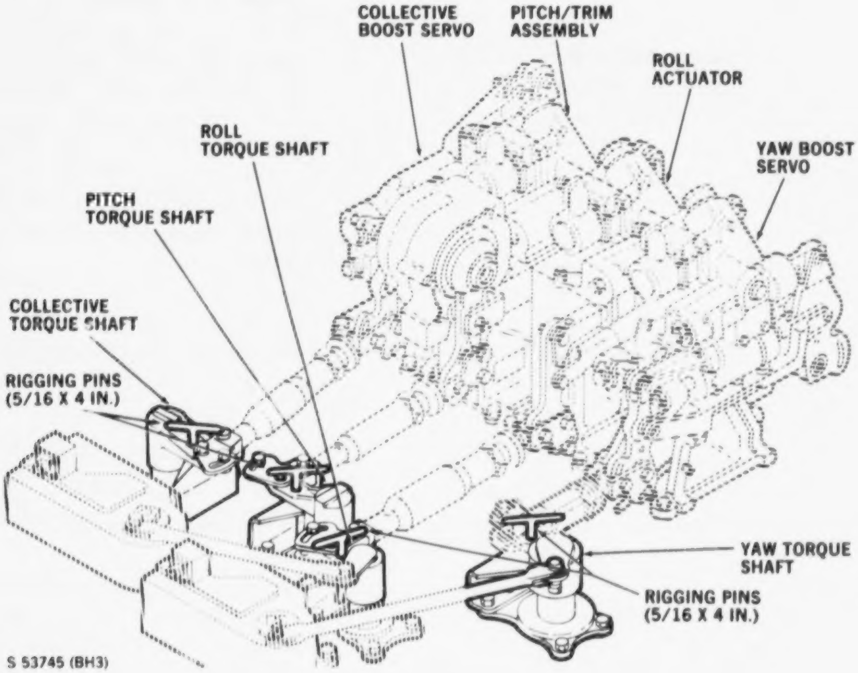

COLLECTIVE BOOST SERVO
PITCH/TRIM ASSEMBLY
ROLL ACTUATOR
ROLL TORQUE SHAFT
YAW BOOST SERVO
PITCH TORQUE SHAFT
COLLECTIVE TORQUE SHAFT
RIGGING PINS (5/16 X 4 IN.)
YAW TORQUE SHAFT
RIGGING PINS (5/16 X 4 IN.)
S 53745 (BH3)

FIGURE 11-10

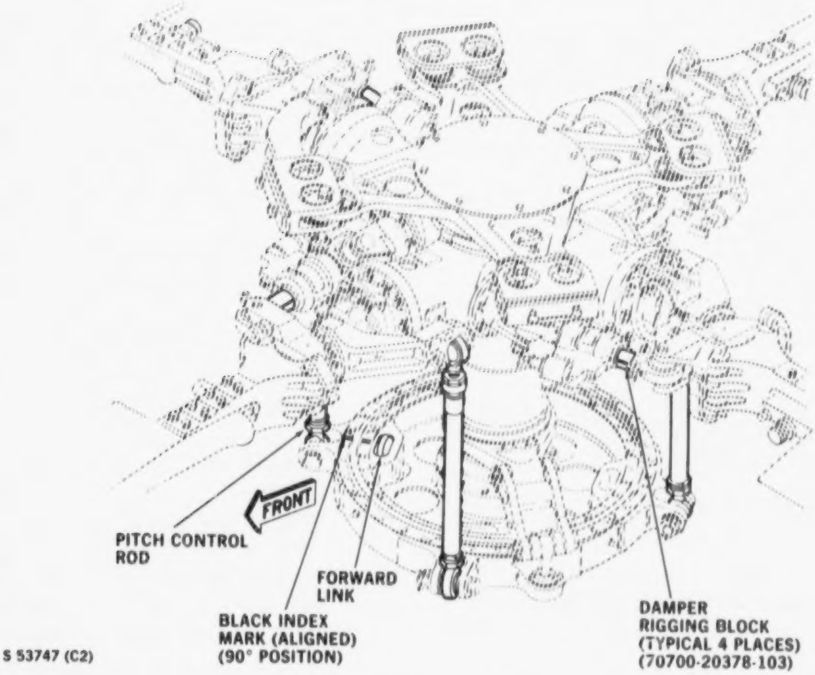

FRONT
PITCH CONTROL ROD
FORWARD LINK
BLACK INDEX MARK (ALIGNED) (90° POSITION)
DAMPER RIGGING BLOCK (TYPICAL 4 PLACES) (70700-20378-103)
S 53747 (C2)

FIGURE 11-11

11-2.2 RIG/CHECK OF MAIN ROTOR 11-2.2

NOTE

Proper rigging of controls is impossible if swashplate bearing retainers are out of position. Prior to any rigging check, be sure that black rigging marks on swashplate bearing retainers are aligned with control rod centerlines, and stationary control rod centerlines.

CHECK COLLECTIVE ANGLES

t. Apply main rotor gust lock to hold rotor head. Install four damper rigging blocks and hold with tiedown straps, Item 370, Appendix D. Release gust lock.

u. Turn main rotor head until black index marks on swashplates line up, and red pitch control rod is aligned with the forward link (90°).

v. If deice is installed, remove main rotor blade electrical connectors.

w. If helicopter has had adjustments for autorotational RPM and/or blade track made to pitch control rods, do this:

(1) Remove rigging pins from collective upper torque shaft.

NOTE

- Use Main Rotor Rigging Worksheet to record readings.
- Cycle collective at least three times before taking collective pitch readings.
- Have assistant in cockpit hold collective stick in required position when blade angle measurements are taken.

(2) With collective stick in low pitch position, measure blade angle of #1 (red) blade, as blade is positioned at 90°, 180°, 270°, and 0° locations. **AVERAGE SHOULD BE -0.5 TO +0.5.**

(3) With collective stick in high pitch position, measure blade angle of #1 (red) blade as blade is positioned at 90°, 180°, 270°, and 0° locations. **AVERAGE SHOULD BE 15.5° TO 17.5° GREATER THAN LOW PITCH AVERAGE.** Check that swashplate ball does not extend beyond transmission guide more than 0.250 inch (Figure 11-13).

(4) Move collective stick to low pitch position, and place pin in collective upper torque shaft.

(5) If low and high collective pitch averages are as above, and swashplate ball does not extend too far, continue with CHECK LONGITUDINAL ANGLES.

WARNING

To avoid injury to personnel and damage to equipment, an autorotational flight check and the ability to obtain required high power setting must be done on completion of these rigging checks.

NOTE

If low and high collective pitch averages are not within above limits, or if swashplate extends beyond transmission guide too much, do next step.

x. If a new rotor head with new pitch control rods has been installed, do this:

(1) Using propeller protractor, adjust #1 (red) blade at 90° position to a preliminary angle of between 8° and 11°.

(2) Adjust pitch control rod of #1 (red) blade, if required, until average blade angle, as blade is positioned at 90°, 180°, 270°, and 0° locations, is -0.2° ±0.125°. Once this angle is satisfied for red blade, turn each of remaining three blades to 90° location and adjust each pitch control rod to be same as red blade angle. Check to be sure that exposed threads on each pitch control are not more than 0.75 inch.

11-2.2 RIG/CHECK OF MAIN ROTOR 11-2.2

MAIN ROTOR RIGGING WORKSHEET
#1 (RED BLADE POSITION)

CONTROL POSITIONS	90° RT	180° FWD	270° LFT	0° AFT	TOTAL °	AVG	REQUIRED TOLERANCE
LOW COLL ANGLE LOW COLL NEUTRAL CYCLIC NEUTRAL YAW BLADES	#1						BLADES #2, #3, #4 SAME AS #1 BLADE
	#2	X	X	X			−0.075° TO −0.325° (SEE NOTE)
	#3	X	X	X			
	#4	X	X	X			
HIGH COLL ANGLE HIGH COLL NEUTRAL CYCLIC NEUTRAL YAW							+15.4° TO 16.4° (SEE NOTE)
FWD CYCLIC ANGLE HIGH COLL NEUTRAL LAT FWD CYCLIC NEUTRAL YAW		X		X			DIFFERENCE BETWEEN 90° & 270° POSITIONS +33.0° MIN.
AFT CYCLIC ANGLE HIGH COLL NEUTRAL LAT AFT CYCLIC NEUTRAL YAW		X		X			DIFFERENCE BETWEEN 90° & 270° POSITIONS NOT LESS THAN + 17°
LEFT CYCLIC ANGLE LOW COLL NEUTRAL LONG LEFT CYCLIC NEUTRAL YAW	X		X				AVERAGE RANGE + 7.5° TO 8.5° SUM BETWEEN 0° & 180° POSITION TO BE 15° TO 17°
RIGHT CYCLIC ANGLE LOW COLL NEUTRAL LONG RIGHT CYCLIC NEUTRAL YAW	X		X				AVERAGE RANGE + 7.0° TO 8.0° SUM BETWEEN 0° & 180° POSITION TO BE 14.0° TO 16.0°
(FWD) 180° (LEFT) 270° ⊕ 90° (RIGHT) 0° (AFT)							

NOTE

SEE TEXT FOR TOLERANCE WHEN PITCH CONTROL RODS HAVE BEEN ADJUSTED FOR AUTOROTATIONAL RPM AND/OR BLADE TRACK.

S 53748 (BH4)

FIGURE 11-12

(3) Remove rigging pin from collective torque shaft at top of cabin.

NOTE

- Use Main Rotor Rigging Worksheet to record readings.
- Cycle collective at least three times before taking collective pitch readings.
- Have assistant in cockpit hold collective stick in required position when blade angle measurements are taken.

(4) Move collective stick to high pitch position. Check that average angle of #1 (red) blade reads 16.4° to 15.4° as the blade is positioned at 90°, 180°, 270°, and 0° locations.

(5) If blade angle average does not read 16.4° to 15.4°, back off copilot's stick stop enough so as not to interfere with adjustment of pilot's stick.

11-2.2 RIG/CHECK OF MAIN ROTOR

(6) Adjust pilot's collective stick stop until average blade angle of #1 (red) blade reads 15.4° to 16.4° as the blade is positioned at 90°, 180°, 270°, and 0° locations.

(7) Adjust copilot's collective stick stop to have 0.010 to 0.030 inch gap between stick and stopbolt when pilot's collective stick is bottomed.

CAUTION

To prevent damage to swashplate ball, check that swashplate ball does not extend past transmission guide by more than 0.250 inch.

y. If swashplate ball extension is more than 0.250 inch past transmission guide, readjust high collective stick stop. Recheck high collective averages.

z. Move collective stick to low pitch position and install rigging pin in collective torque shaft.

CHECK LONGITUDINAL ANGLES

aa. Remove rigging pins from pitch trim actuator, and pitch torque shaft.

ab. Remove both pins, 70700-20380-065 from pilot's and copilot's cyclic stick fore and aft (pitch) direction.

ac. Remove rigging pin from collective torque shaft.

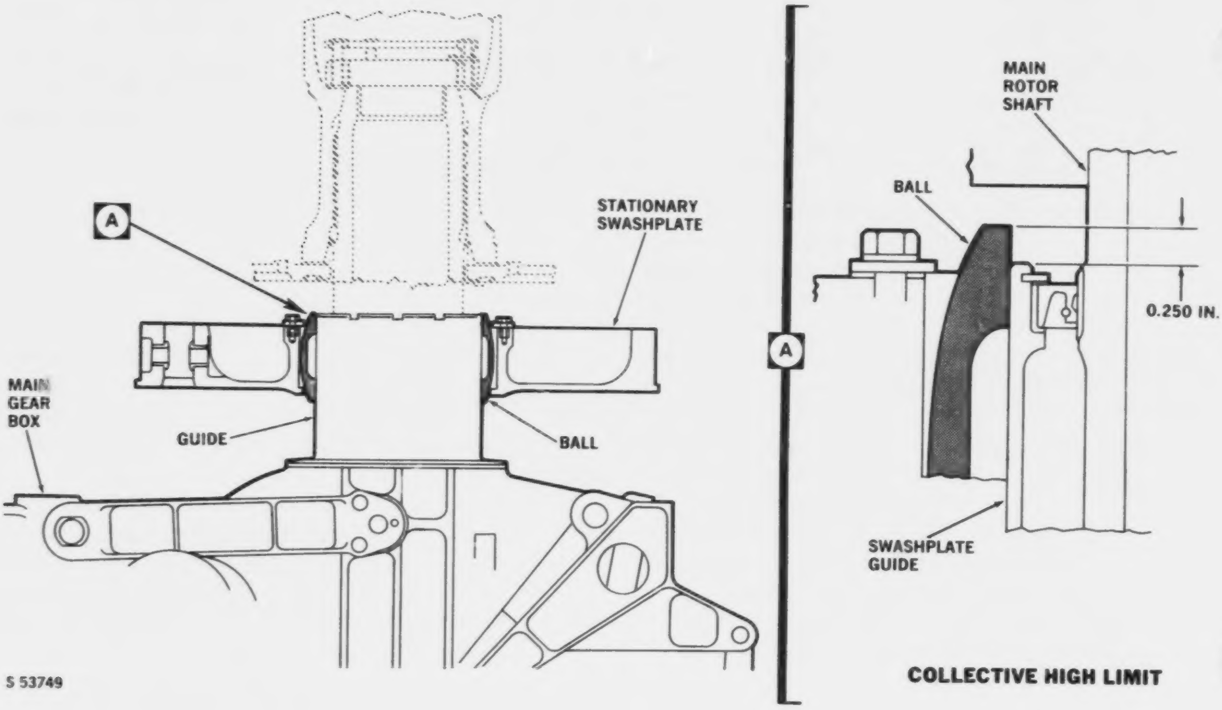
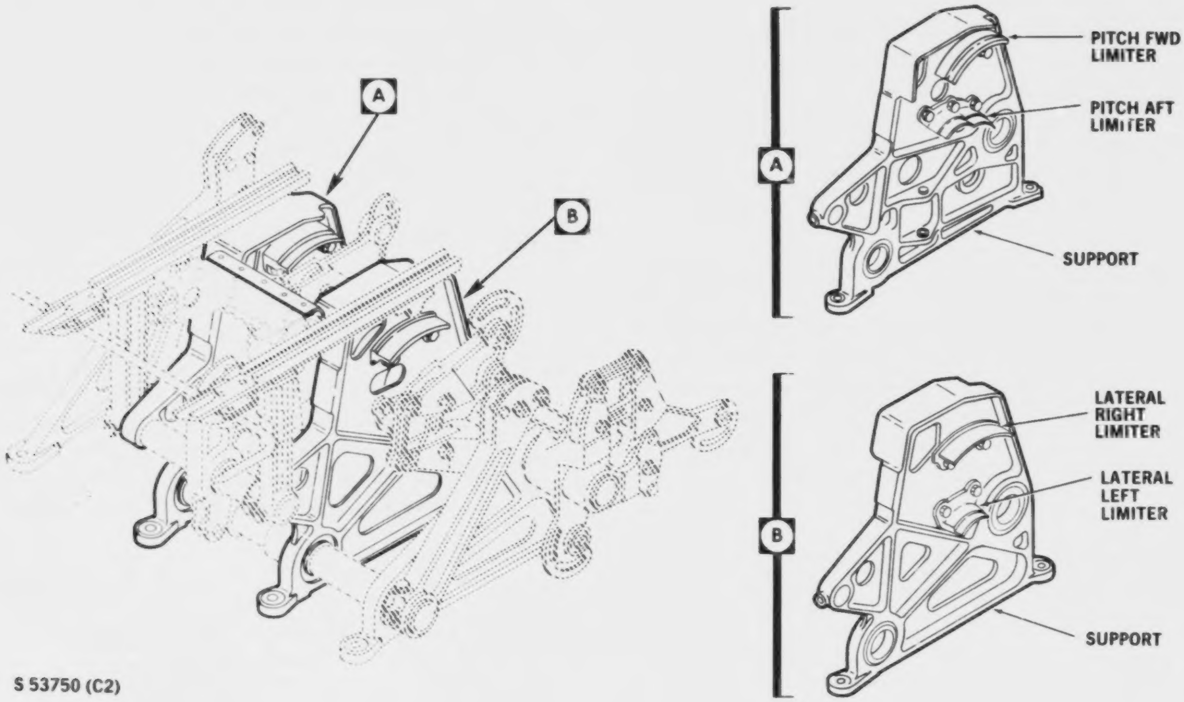

A
STATIONARY SWASHPLATE
MAIN GEAR BOX
GUIDE
BALL
S 53749
A
MAIN ROTOR SHAFT
BALL
0.250 IN.
SWASHPLATE GUIDE
COLLECTIVE HIGH LIMIT

FIGURE 11-13



S 53750 (C2)

FIGURE 11-14

ad. While holding collective pitch stick at high pitch stop, move cyclic stick full forward. Make sure pitch forward limiter roller cannot be freely turned, and that cyclic stick is not touching front stopbolt on yoke. Measure blade angle at 90° and 270° location. If range difference between both readings is not less than 33.0°, and pitch forward limiter roller cannot be freely turned, no further adjustment is required. If range difference between both readings is less than 33° and forward limiter roller can be freely turned, check for interference with linkage forward of mixer. Roller must bottom on limiter so it cannot be turned freely by hand.

NOTE

Cyclic grip is allowed to touch glare shield padding or instrument knobs with forward stop on cyclic stick properly set.

ae. If forward limiter is bottomed and roller cannot be turned, but blade angle difference is less than 33.0°, do this adjustment:

(1) Shorten forward primary servo pushrod by turning barrel to right, while facing to rear, and lengthen aft primary servo pushrod by turning barrel to left, same amount, while facing to rear. Do this adjustment until difference between both readings is not less than 33.0° at high collective/forward stick.

af. While holding high collective, move cyclic stick full aft with #1 (red) blade at 90° location and at 270° location. Read blade angles for both locations. Difference between 90° and 270° location should not be less than 17.0°. Adjust cyclic pitch stick aft stop until you have this reading. If adjustment on cyclic stick aft stop is not enough:

ag. Lengthen input pitch control rod to pitch/trim assembly (Figure 11-16) until you have this reading. Adjust copilot's cyclic stick stop to match pilot's. Make certain copilot's stop is not contacted first. Record this bias adjustment for future reference. Recheck high collective, forward stick readings at 90° to 270° to be sure 33.0° is maintained.

ah. If necessary, adjust forward and aft primary servos control rods until both high collective, forward, and aft readings are as required. If you cannot get both readings, check for interferences in control system. Check low collective pitch and high collective pitch average readings again.

CHECK LATERAL ANGLES

ai. Remove lateral (roll) rigging pins from pilot's and copilot's cyclic stick.

aj. Move pilot's collective pitch stick to full low pitch position and lock in place. Remove rigging pin from roll torque shaft and roll actuator, and reinstall (5/16 x 4 in.) pin in pitch torque shaft and pitch/trim assembly.

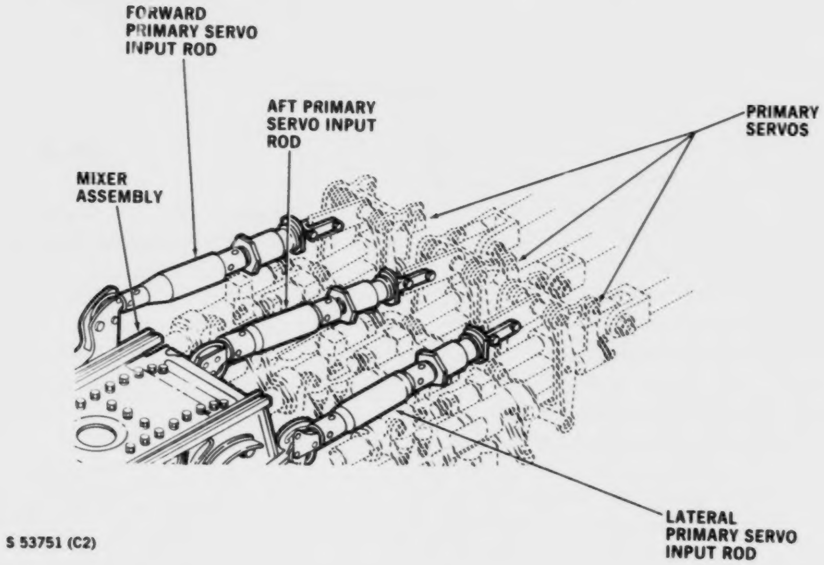

FORWARD PRIMARY SERVO INPUT ROD
AFT PRIMARY SERVO INPUT ROD
PRIMARY SERVOS
MIXER ASSEMBLY
LATERAL PRIMARY SERVO INPUT ROD
S 53751 (C2)

FIGURE 11-15

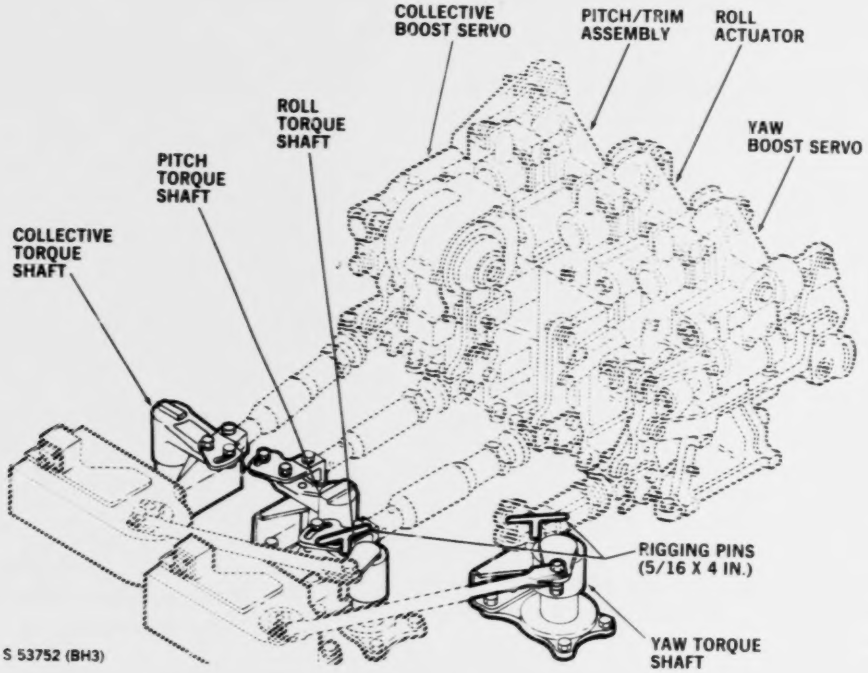

COLLECTIVE BOOST SERVO
PITCH/TRIM ASSEMBLY
ROLL ACTUATOR
ROLL TORQUE SHAFT
YAW BOOST SERVO
PITCH TORQUE SHAFT
COLLECTIVE TORQUE SHAFT
RIGGING PINS (5/16 X 4 IN.)
YAW TORQUE SHAFT
S 53752 (BH3)

FIGURE 11-16

ak. Move cyclic stick full left until roller contacts lateral left limiter in mixer. Install pilot's and copilot's cyclic stick fore-and-aft rigging pin.

al. Adjust pilot's and copilot's left stick stop at base of cyclic stick to 0.010- to 0.030-inch clearance. Move #1 (red) blade to 180° and 0° location and measure blade angle at both locations. Left lateral cyclic range is found by adding 180° reading to the 0° reading, ignoring that this reading is negative. Sum of both readings should be 15° to 17°.

am. If sum is less than 15°, adjust lateral primary servo input control rod as follows: Shorten lateral primary servo control rod by turning barrel to right while facing rear. Do this adjustment until total angle between 0° and 180° location reads 15° to 17°.

an. Move cyclic stick full right until roller contacts lateral right limiter in mixer. Adjust pilot's and copilot's right stick stops, at base of cyclic stick, to 0.010- to 0.030-inch clearance. Move #1 (red) blade to 180° and 0° locations and measure blade angle at both locations. Add 0° reading to 180° reading, ignoring that this reading is negative. Sum of these two readings should be 14° to 16°. If you cannot get this reading, adjust controls as follows:

(1) Lengthen lateral primary servo input control by turning barrel to left while facing rear. Do this adjustment until low right cyclic reading is between 7.0° and 8.0°.

(2) Check low left cyclic range again, to be sure it is still within range. Adjust lateral primary servo control rod until both lateral range requirements are satisfied.

ao. Remove, in the order indicated, the following rig pins:

(1) Pitch trim assembly.

(2) Yaw torque shaft.

(3) Pitch torque shaft.

(4) Pilot's and copilot's pedal adjustor.

(5) Pilot's and copilot's cyclic stick fore-and-aft (pitch).

Q/C CHECKS

ap. Move collective stick fully down, and cyclic stick fully forward.

aq. Check to be sure that roller contacts forward limiter, and cannot be turned by finger pressure.

ar. Move cyclic stick fully aft.

as. Check to be sure that roller contacts aft limiter, and cannot be turned by finger pressure.

at. Remove yaw boost servo rigging tool.

au. Connect and rig engine LDS cables and rotary inputs (PARA 4-10).

av. Do these QC checks in flight control rods:

(1) No passage of 0.020-inch lockwire through control rod inspection holes.

(2) Main rotor pitch control rods above rotating swashplate, for no more than 3/4-inch thread showing.

(3) Primary servo input rods for lockwire.

(4) Control rods for lockwire.

(5) Cotter pins installed in nuts where required.

(6) Cyclic and collective stick stopbolts for lockwire.

(7) All rigging pins and damper blocks removed.

aw. Check collective and cyclic balance springs as follows:

(1) Connect external electrical power

(2) On AFCS control panel, place BOOST switch ON.

(3) Pull collective stick up to high collective. With pilot's friction lock fully loosened, stick should stay up and not move.

(4) Push collective stick down to low collective, with pilot's friction lock fully loosened. **UPWARD MOVEMENT MUST NOT EXCEED 0.50 INCH.**

(5) On AFCS panel put TRIM switch OFF.

(6) Move cyclic stick to neutral position.

(7) Push stick forward about 6 inches. Let go of stick. Stick should not move forward. Move it forward again until it is almost fully forward. Let go of stick. It should not move forward.

(8) If collective or cyclic sticks move when they are let go, adjust balance springs (PARAS 11-2.7 and 11-2.8).

ax. Disconnect all hydraulic and electrical power.

ay. Service hydraulic systems (PARA 7-6).

az. If main rotor pitch control rods have been adjusted for collective angles, adjust them for pretrack by doing this:

  (1) Divide number stencilled on bottom of blade by 2. This number is the number of notches to turn rod.

  (2) Loosen locknuts on rod and turn rod in +2 MINUTES/NOTCH direction if number on blade is positive, or -2 MINUTES/NOTCH direction if number on blade is negative.

  (3) Check to be sure that exposed threads on each pitch control are not more than 0.75 inch.

  (4) Lock tang in notch by tightening upper locknut. **TORQUE NUT TO 250-300 INCH-POUNDS.** Lockwire, Item 199, Appendix D, nut to control rod.

  (5) **TORQUE LOWER LOCKNUT TO 250-300 INCH-POUNDS.** Lockwire, Item 199, Appendix D, nut to control rod.

ba. If main rotor blade deice electrical connectors were disconnected, connect them.

bb. Reset PLT VSI circuit breaker on No. 2 ac primary circuit breaker panel.

bc. If necessary, reset BACKUP HYD CONTR circuit breaker on DC ESNTL BUS.

bd. Install pilot's and copilot's stick boots (PARA 11-5).

be. Check that area is clean and free from foreign objects before closing cover.

bf. Install work platform on mixer.

bg. Install main pylon sliding cover.

bh. Move helicopter outside and check blade track (PARA 5-18).

bi. Do a maintenance test flight of autorotational RPM and high collective stop (TM 55-1520-237-MTF).

11-2.3 RIG/CHECK OF TAIL ROTOR 11-2.3

WARNING

To prevent damage to equipment or injury to personnel, a tail rotor rig check is required after cable tensioning and/or replacement of the following parts:

- Forward quadrant
- Torque lever to forward quadrant pushrod
- Control cables
- Cable pulleys
- Tail rotor gear box
- Tail rotor components
- Tail rotor servo

CAUTION

- Put sign in cockpit to notify personnel that flight controls should not be moved during rigging, as damage to components could result.
- Do not store self-retaining bolts in bearings.
- To prevent damage to antiflap cam and antiflap stop attaching bolts, antiflap cam must be held in flight position when cycling flight controls with main rotor blades removed.

a. If main rotor blades are not installed, pull up antiflap cam levers (flight position) and tie them to horn with tiedown straps, Item 370, Appendix D.

NOTE

Main rotor must be in proper rig before rigging tail rotor.

b. Open main rotor pylon sliding cover.

c. Remove tail gear box forward fairing.

NOTE

The backup pump should be used only as an alternate source to power the hydraulic systems. External hydraulic power should be applied whenever available.

d. Pressurize backup hydraulic system (PARA 1-6).

e. If using external hydraulic power, on DC ESNTL BUS, pull BACKUP HYD CNTL circuit breaker.

f. Connect a source of electrical power. Be sure EXTERNAL POWER switch is on.

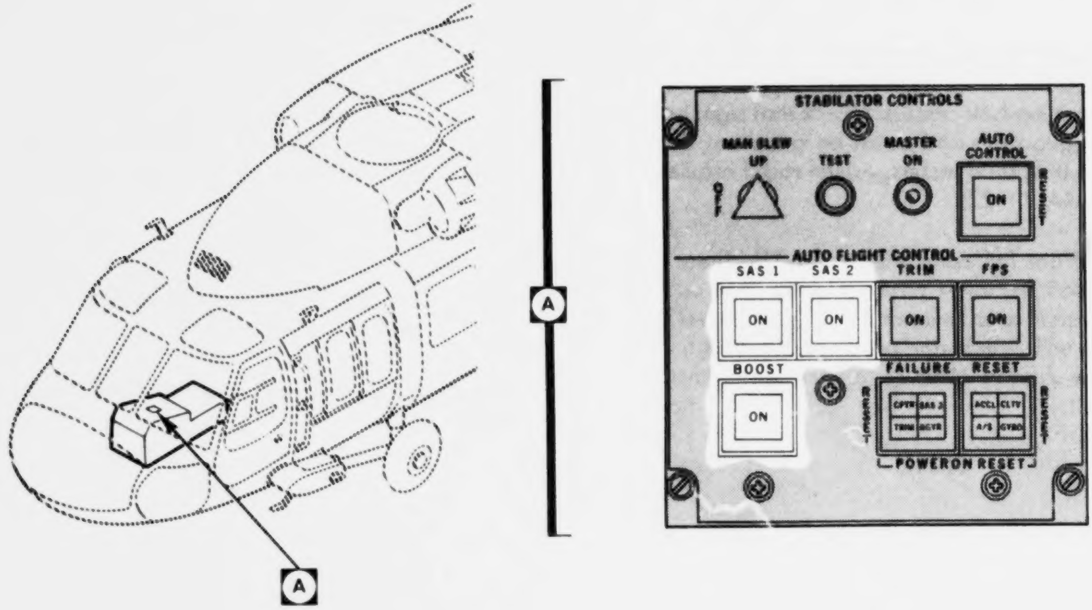
g. If SAS button light is on, push SAS buttons, on FLIGHT CONTROLS panel in center console, until ON light goes off.

h. Push BOOST to ON.

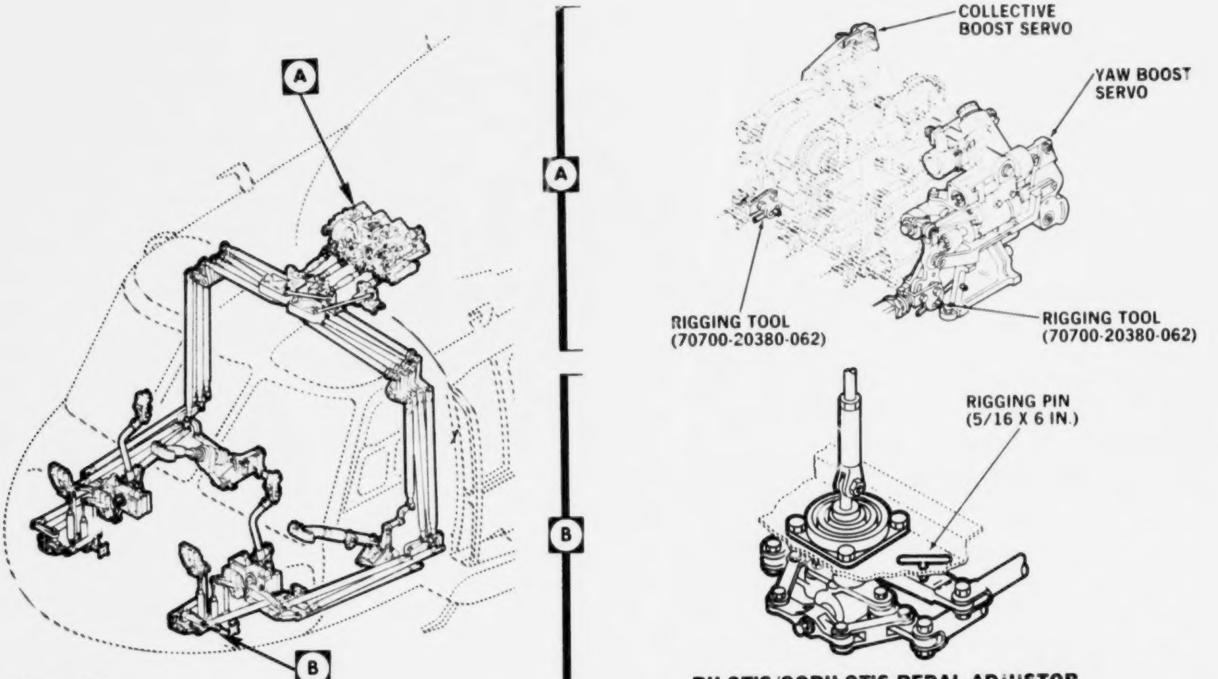
i. Install rigging pin, 70700-20380-062, on yaw boost servo, to hold servo in neutral.

j. Install rigging pin, 70700-20380-062, on collective boost servo, to hold servo in midposition.

k. Install rigging pin (5/16 in. x 6 in.) in either pilot's or copilot's yaw pedal adjustor.


A
A
STABILATOR CONTROLS
MAN SLEW
UP
OFF
TEST
MASTER
ON
AUTO
CONTROL
ON
RESET
AUTO FLIGHT CONTROL
SAS 1
SAS 2
TRIM
FPS
ON
ON
ON
ON
BOOST
ON
FAILURE
RESET
RESET
CPTR
SAS 2
TRIM
DGYR
ACCL
CLTV
A/S
GYRO
RESET
POWERON RESET

S 45541.1 (BH4)


A
A
B
B
COLLECTIVE
BOOST SERVO
YAW BOOST
SERVO
RIGGING TOOL
(70700-20380-062)
RIGGING TOOL
(70700-20380-062)
RIGGING PIN
(5/16 X 6 IN.)

PILOT'S/COPILOT'S PEDAL ADJUSTOR

S 45541.2 (C9)

FIGURE 11-17 (SHEET 1 OF 3)

11-2.3 RIG/CHECK OF TAIL ROTOR 11-2.3

l. Install rigging pin (1/4 x 6 in.) in tail rotor servo. If pin will not go in, do this:

   (1) Check servo-to-quadrant pushrod for 12.56 - 12.68-inch length between self-retaining bolt centers. Check that sight hole on quadrant and notch on quadrant base is within 0.05 inches. Adjust rod if required (PARA 11-27).

   (2) In front tail cone (Figure 11-18, Sheet 3, Detail D) adjust turnbuckles so that cable tension is in limits and tail rotor servo rig pin will slide in and out freely at same time. Use chart in PARA 11-2.4 for cable tension limits.

NOTE

Do not go over cable tension limits for temperature.

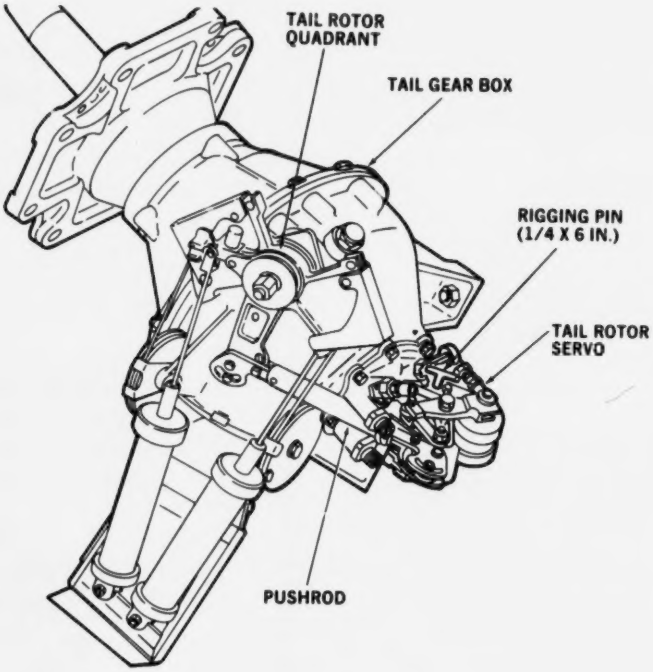
m. Remove self-retaining bolts, washers, and nuts connecting pitch control rods to pitch change beam (PARA 5-23).

n. With each blade, in turn, horizontal and pointing forward, adjust and connect pitch control rods as required until attaching bolts drop freely into holes on pitch change beam.

NOTE

Do not put any pressure on blades to line up attaching boltholes.

o. Install pitch control rods on pitch change beam (PARA 5-23).



S 45541.3 (C9)

FIGURE 11-17 (SHEET 2 OF 3)

11-2.3 RIG/CHECK OF TAIL ROTOR 11-2.3

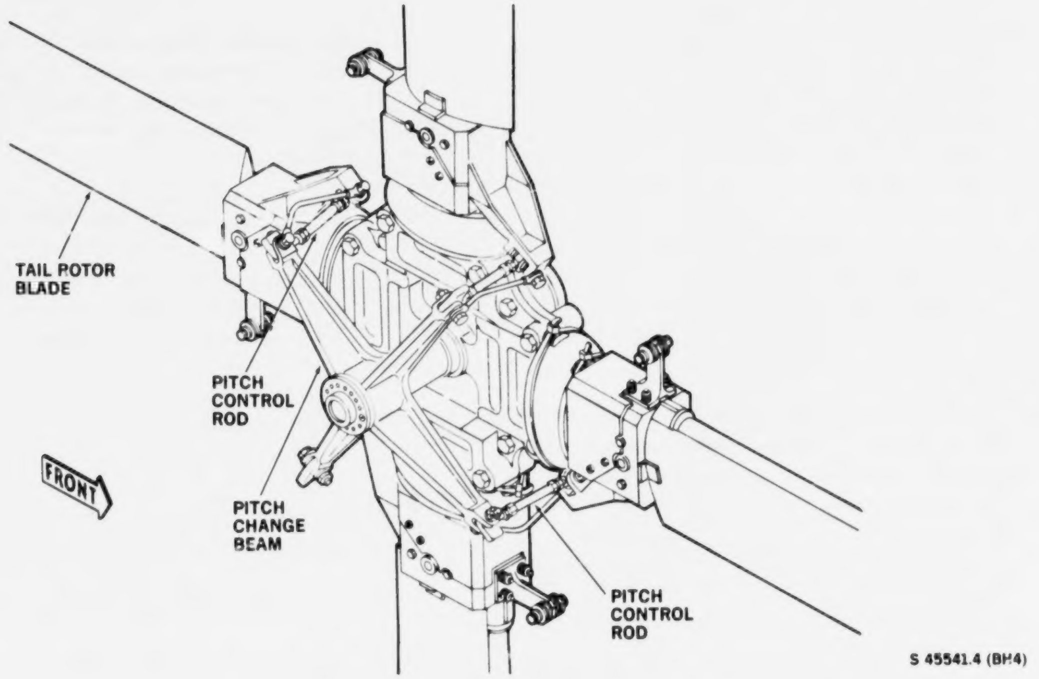

TAIL ROTOR BLADE
PITCH CONTROL ROD
FRONT
PITCH CHANGE BEAM
PITCH CONTROL ROD
S 45541.4 (BH4)

FIGURE 11-17 (SHEET 3 OF 3)

p. Remove these rigging pins in this order:

  (1) 1 tail rotor servo rigging pin
  (2) 1 collective boost rigging pin
  (3) 1 yaw boost servo rigging pin
  (4) 1 yaw pedal adjustor rigging pin

q. Turn off all electrical and hydraulic power.

r. Check that area is clean and free of foreign material before closing cover.

s. Install tail gear box forward fairing.

t. Close main pylon sliding cover.

u. Do a maintenance test flight (TM 55-1520-237-MTF).

11-2.4 RIGGING TAIL ROTOR 11-2.4

CAUTION

- Put sign in cockpit to notify personnel that flight controls should not be moved during rigging, as damage to components could result.
- To prevent damage to antiflap cam and antiflap stop attaching bolts, antiflap cam must be held in flight position when cycling flight controls with main rotor blades not installed.

a. If main rotor blades are not installed, pull up antiflap cam levers (flight position) and tie them to horn with tiedown straps, Item 370, Appendix D.

NOTE

- Main rotor must be in proper rig before rigging tail rotor.
- Complete rigging of tail rotor is done whenever major changes in tail rotor flight controls are made, or when adjustments must be done to system that are not covered in rigging check.

b. Open main rotor pylon sliding cover.

c. Remove tail gear box forward fairing.

d. Hinge down ceiling soundproofing panels at station 311.

e. Remove baggage compartment soundproofing and cargo panels (PARA 2-32).

f. Connect a source of electrical power (PARA 1-7).

NOTE

The backup pump should be used only as an alternate source to power the hydraulic systems. External hydraulic power should be applied whenever available.

g. Pressurize backup hydraulic system.

h. If using external hydraulic power, pull BACKUP HYD CONTR circuit breaker in DC ESNTL BUS on overhead control panel.

i. Push off SAS1, SAS2, and TRIM buttons, on FLIGHT CONTROLS panel in center console. Push BOOST ON.

j. Disconnect spring cylinders from support at tail rotor quadrant (PARA 11-28).

k. Disconnect tail rotor cables (PARA 11-28).

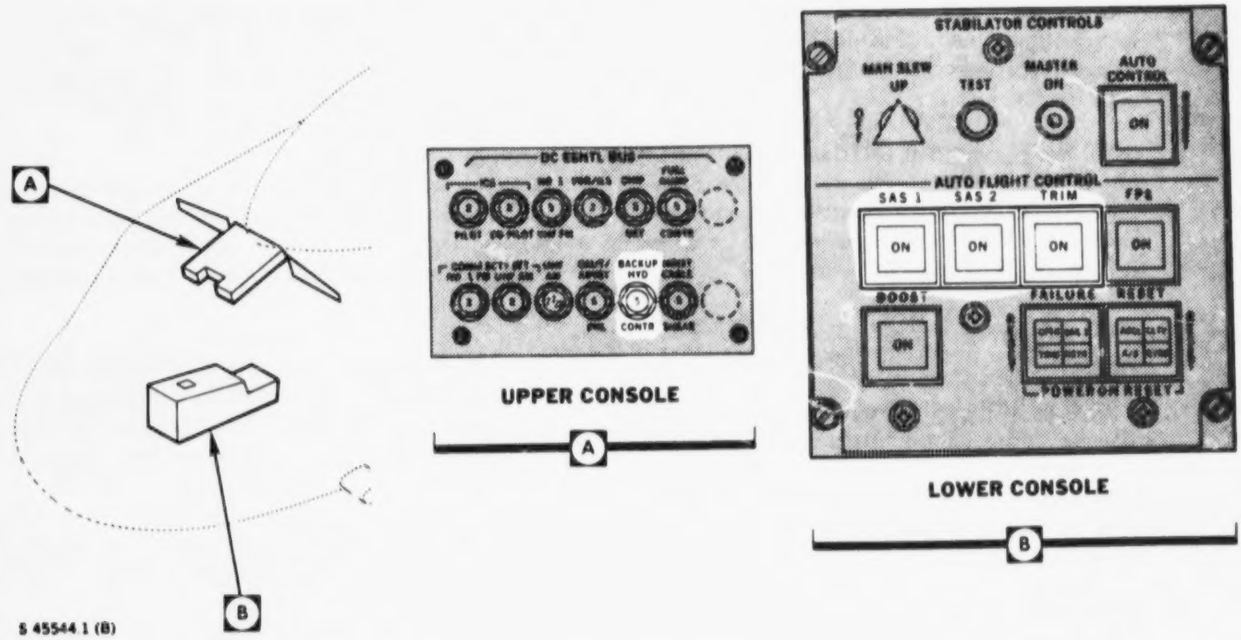
l. Disconnect electrical connectors on tail rotor servo pressure switches (Figure 11-18, Sheet 1).

m. Remove input control rod to tail rotor servo at servo and install rigging pin (1/4 x 6 in.) in tail rotor servo (Figure 11-18, Sheet 4).

n. Connect electrical connectors on tail rotor servo pressure switches (Figure 11-18, Sheet 1).

o. Install rigging pin, 70700-20380-062, on yaw boost servo, to hold servo in neutral position (Figure 11-18, Sheet 2).

p. Install rigging pin (5/16 in. x 4 in.) in yaw torque shaft. Adjust yaw input control rod if necessary.


A
B
DC ESNTL BUS
BACKUP
HYD
CONTR
UPPER CONSOLE
A
STABILATOR CONTROLS
MAN SLEW
UP
TEST
MASTER
ON
AUTO
CONTROL
ON
AUTO FLIGHT CONTROL
SAS 1
SAS 2
TRIM
FPS
ON
ON
ON
ON
BOOST
ON
FAILURE
RESET
POWER ON RESET
LOWER CONSOLE
B
S 45544.1 (B)

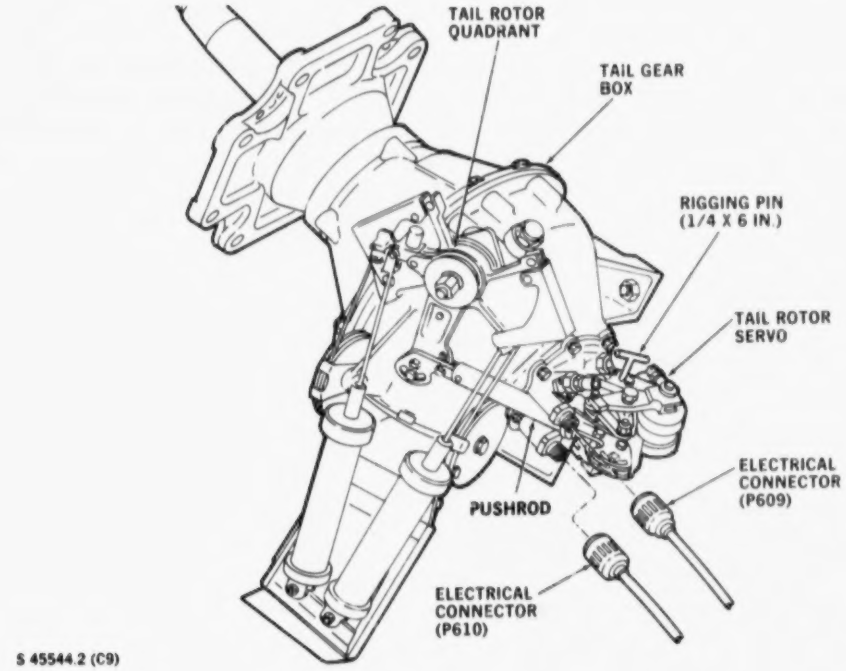

TAIL ROTOR
QUADRANT
TAIL GEAR
BOX
RIGGING PIN
(1/4 X 6 IN.)
TAIL ROTOR
SERVO
ELECTRICAL
CONNECTOR
(P609)
PUSHROD
ELECTRICAL
CONNECTOR
(P610)
S 45544.2 (C9)

FIGURE 11-18 (SHEET 1 OF 6)

q. Move pilot's collective stick to midposition. Install rigging pin, 70700-20380-062, on collective boost servo. Lock stick in this position with friction lock.

r. Install two rigging pins (5/16 in. x 6 in.) in both pilot's and copilot's yaw pedal adjustors. If rigging pins will not go in easily, adjust torque shaft input rods (cabin ceiling) as required (Figure 11-18, Sheet 2, Detail A).

s. Install rigging pin (5/16 in. x 12 in.) in left side of mixer (Figure 11-18, Sheet 3, Detail A).

t. At this time, be sure all control rods are adjusted and connected from cockpit to mixer.

u. Check that output rod from mixer to torque shaft is properly connected (Figure 11-18, Sheet 4, Detail E).

v. Adjust and connect adjustable control rod from torque shaft to quadrant. Tighten jamnuts (Figure 11-18, Sheet 4, Detail E).

NOTE

Control rod is adjusted to correct length when notch in forward quadrant outside diameter is lined up with hole in airframe which holds cable guard. It may be necessary to screw right pedal stop all the way in to do rod adjustment (Figure 11-18, Sheet 4, Detail E).

w. Adjust input pushrod to a length between 12.56 -12.68 inches. Check that sight hole on quadrant and notch on quadrant base is within 0.05 inches. Adjust rod if required (PARA 11-27).

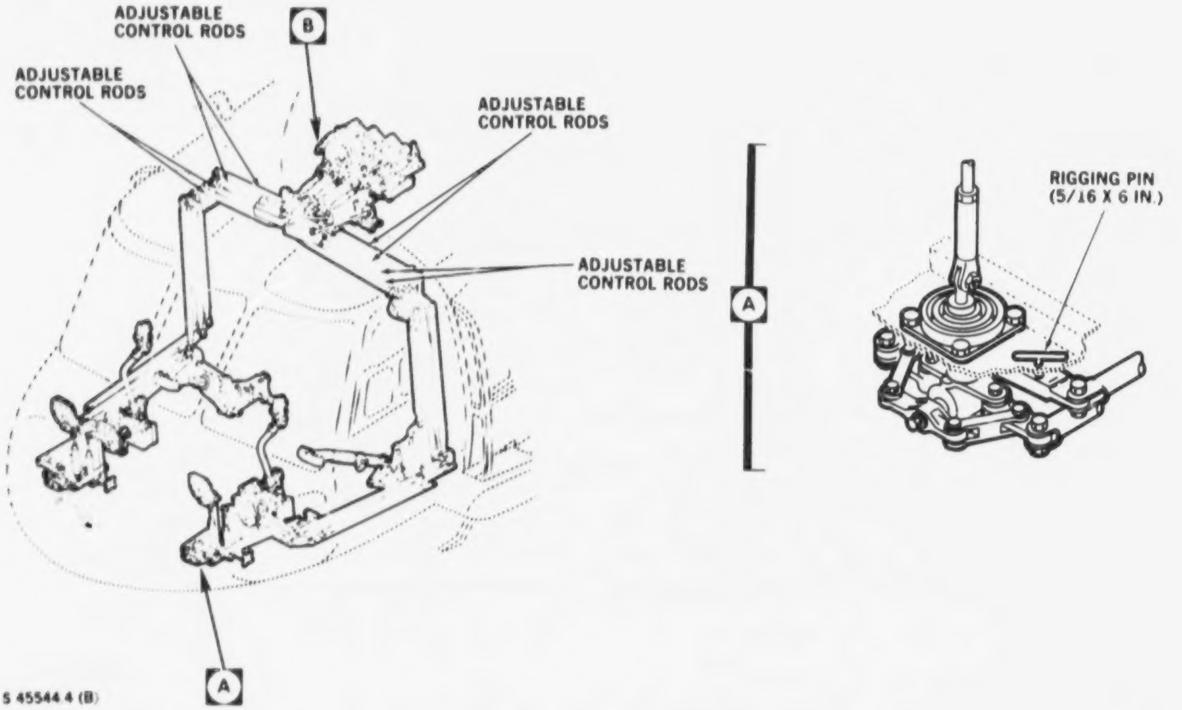
x. Connect cable disconnects. **TORQUE LOCKNUT TO 40 - 60 INCH-POUNDS,** and lockwire, Item 199, Appendix D. Do not use these connections as an adjustment for cable tension.

y. Connect tail rotor input control rod between tail rotor servo and quadrant (PARA 11-27).

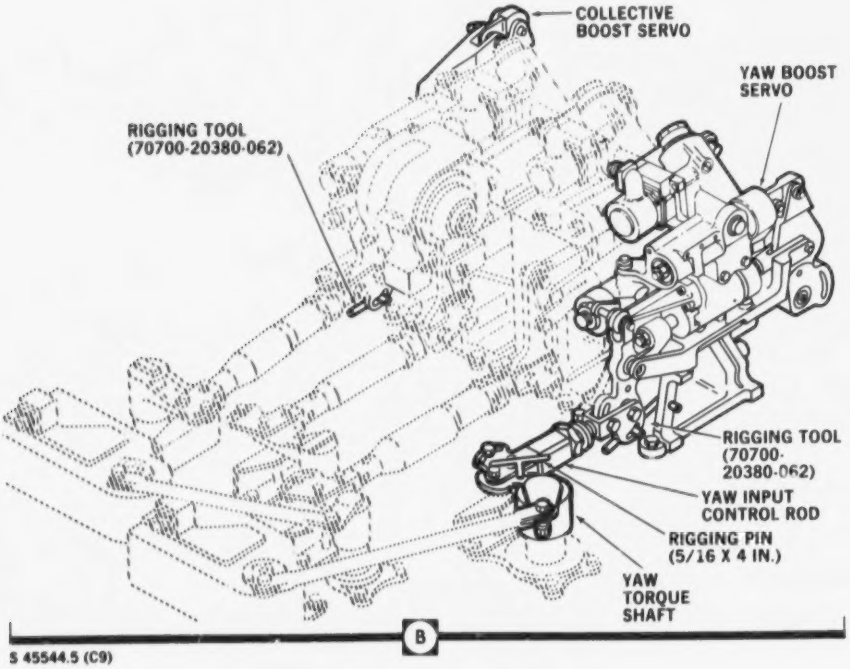
z. In front tail cone (Figure 11-18, Sheet 3), adjust cable tension using Table 11-5 and tensiometer.

aa. Be sure rigging pins in mixer and tail rotor servo remain free at all times. Install new locking clips in turnbuckles.

11-2.4 RIGGING TAIL ROTOR 11-2.4


ADJUSTABLE CONTROL RODS
B
ADJUSTABLE CONTROL RODS
ADJUSTABLE CONTROL RODS
ADJUSTABLE CONTROL RODS
A
RIGGING PIN (5/16 X 6 IN.)
A

S 45544.4 (B)


COLLECTIVE BOOST SERVO
YAW BOOST SERVO
RIGGING TOOL (70700-20380-062)
RIGGING TOOL (70700-20380-062)
YAW INPUT CONTROL ROD
RIGGING PIN (5/16 X 4 IN.)
YAW TORQUE SHAFT
B

S 45544.5 (C9)

FIGURE 11-18 (SHEET 2 OF 6)

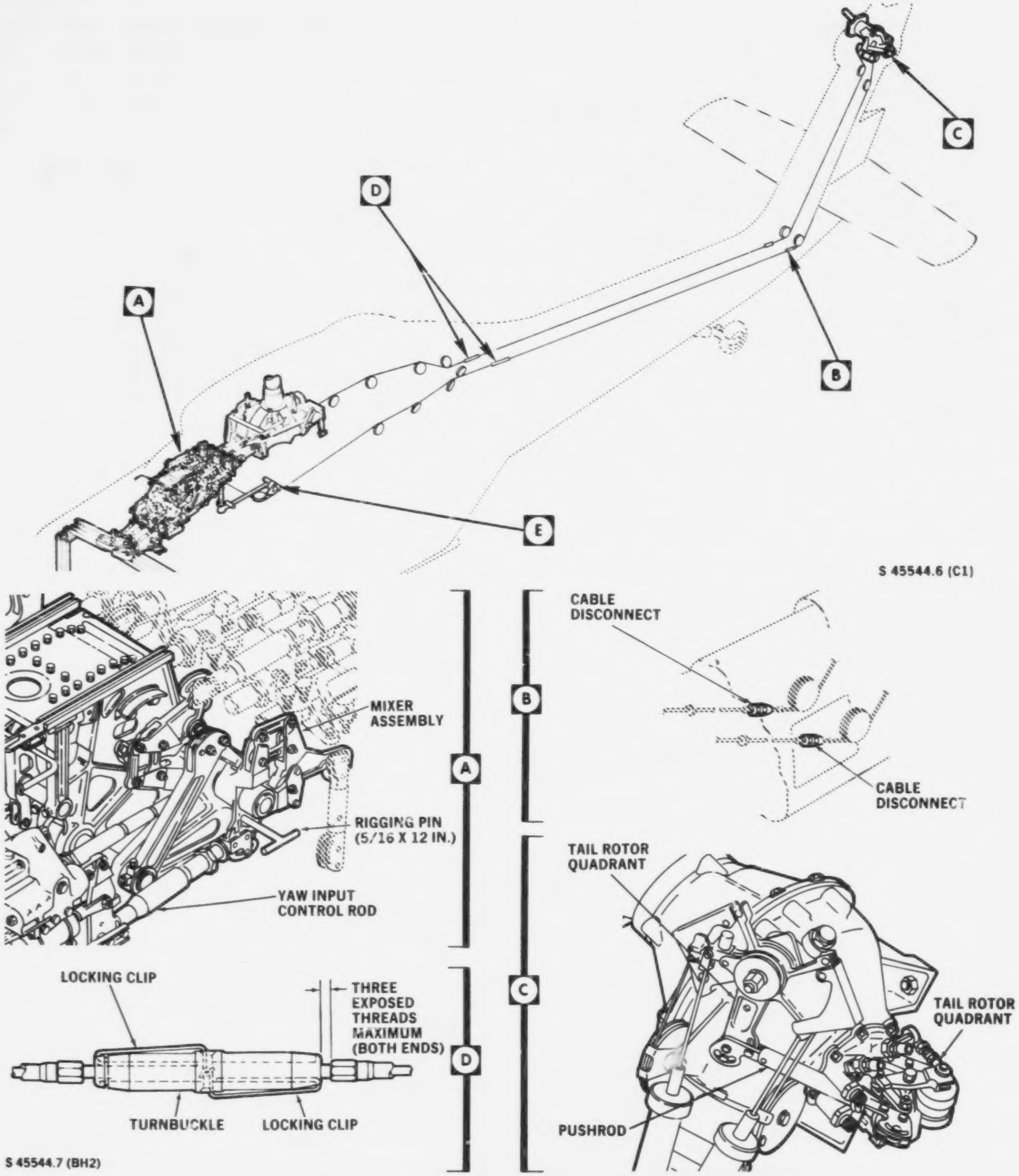
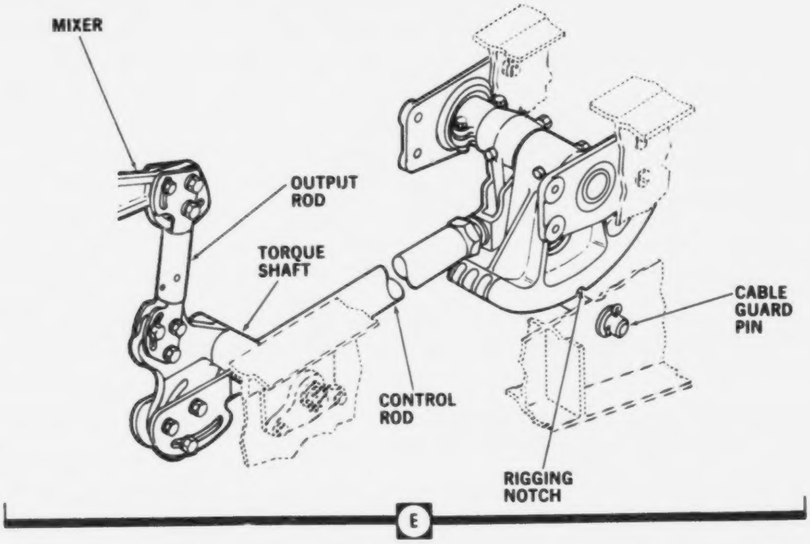
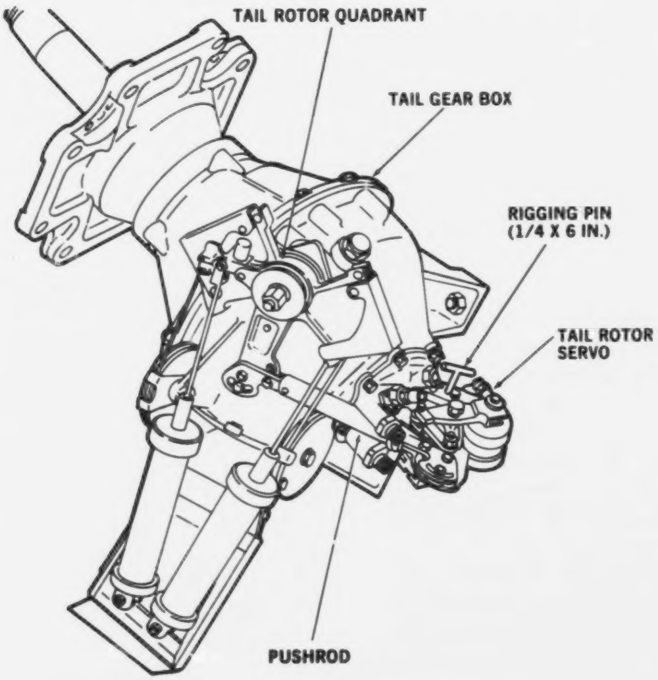

C
D
A
B
E
S 45544.6 (C1)
CABLE DISCONNECT
B
CABLE DISCONNECT
MIXER ASSEMBLY
A
RIGGING PIN (5/16 X 12 IN.)
YAW INPUT CONTROL ROD
TAIL ROTOR QUADRANT
C
TAIL ROTOR QUADRANT
PUSHROD
LOCKING CLIP
THREE EXPOSED THREADS MAXIMUM (BOTH ENDS)
D
TURNBUCKLE
LOCKING CLIP
S 45544.7 (BH2)

FIGURE 11-18 (SHEET 3 OF 6)


MIXER
OUTPUT ROD
TORQUE SHAFT
CABLE GUARD PIN
CONTROL ROD
RIGGING NOTCH
E

S 45544.8 (C9)


TAIL ROTOR QUADRANT
TAIL GEAR BOX
RIGGING PIN (1/4 X 6 IN.)
TAIL ROTOR SERVO
PUSHROD

S 45544.11 (C9)

FIGURE 11-18 (SHEET 4 OF 6)

TABLE 11-5. Tail Rotor Cable Temperature Correction Chart

Temperature Range Degrees "F"	Temperature Range Degrees "C"	Cable-Tension In Pounds
+5 to +24	-15 to -5	61 to 85
+25 to +44	-4 to +7	85 to 109
+45 to +64	+7 to +18	109 to 133
+65 to +84	+18 to +29	133 to 168
+85 to +104	+29 to +40	168 to 191
+105 to +124	+41 to +51	191 to 215
+125 to +144	+52 to +63	215 to 237
+145 to +160	+63 to +71	237 to 250

1. Check cable tension only after helicopter has been at an even temperature for 1 hour. Do not check tension with helicopter parked in hot sun. Tolerance on specified tension values is ±2% difference between two cables.

2. If temperatures below +5°F are anticipated, set tension to 75 pounds. Reset tension to chart before helicopter is operated at temperatures above 40°F.

3. Flight control cables are 5/32-inch diameter, and with a plastic coating the total diameter is 7/32 inch. Measure cable tension with proper tensiometer setting.

(1) When using adjustable risers, the No. 3 riser adapts to 7/32-inch-diameter cable.

(2) When tensiometer does not have adjustable risers, use the 5/32-inch-diameter tension scale.

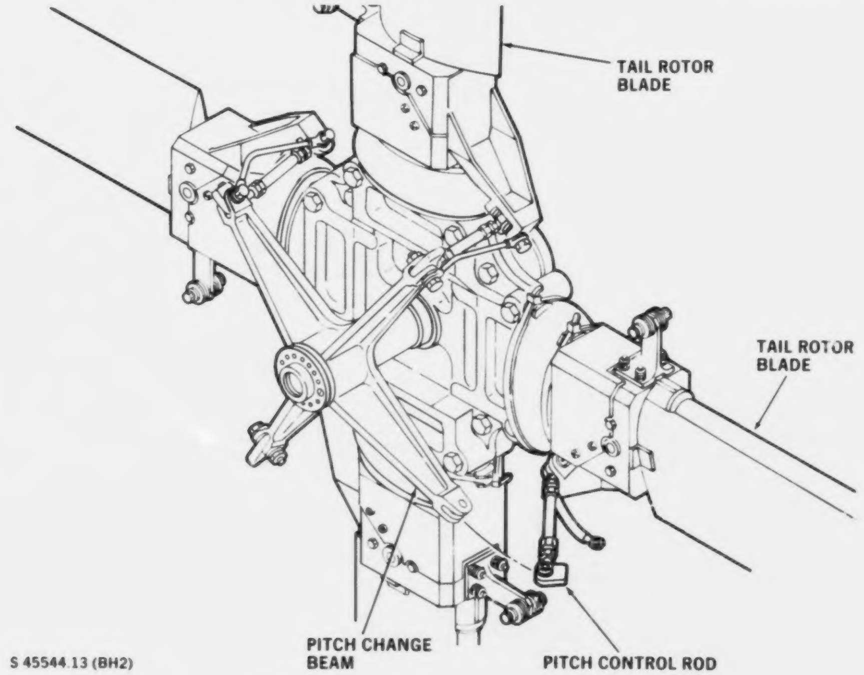


FIGURE 11-18 (SHEET 5 OF 6)

ab. After cable tension has been set, check that rigging pin in tail rotor servo can be removed and reinstalled easily without pulling or pushing on servo input linkage. If not, readjust cable tension. Safety turnbuckles with locking clips.

ac. With each blade, in turn, in horizontal position pointing forward, unbolt pitch control rod from pitch change beam.

ad. Adjust pitch control rod as required until attaching bolts drop freely into holes on pitch change beam.

NOTE

Do not put any pressure on blades to line up attaching boltholes.

ae. Install pitch control rods to pitch change beam, torque and lockwire pitch control rods (PARA 5-18).

af. Remove all rigging pins in this order:

(1) 1 tail rotor servo rigging pin

(2) 1 mixer rigging pin

(3) 1 collective boost servo rigging pin

(4) 1 yaw boost servo rigging pin

(5) 1 yaw torque shaft rigging pin

(6) 2 yaw pedal adjustor rigging pins

ag. Raise collective stick fully up, and lock in place.

ah. Thread in left and right pedal stopbolts at front torque shaft lever installation just below mixer.

NOTE

Spring cylinders must be disconnected to obtain the following tail rotor left and right range limits.

ai. Push left pedal until tail rotor servo fully extends. While left pedal is fully pressed, note length of exposed piston rod between servo housing and piston rod yoke (Figure 11-19).

NOTE

Length of exposed piston must be greater than 3.50 inches.

aj. With left pedal fully pressed, adjust left pedal stopbolt at front torque shaft lever installation just below mixer until stop is contacted. Turn stop out in 1/2-turn increments while cycling pedals. Recheck extended dimension between adjustments until noted dimension is decreased by 0.010 -0.060 inch.

ak. **EXPOSED PISTON ROD BETWEEN SERVO HOUSING AND PISTON ROD YOKE WILL READ 3.44 INCHES OR GREATER AT FULL LEFT PEDAL AFTER ABOVE ADJUSTMENTS ARE PERFORMED.** Lockwire, Item 199, Appendix D, bolt.

al. Unlock collective stick and move to full down position. Lock collective stick in place.

am. Push right pedal until tail rotor servo bottoms (less than 0.030 inch gap between servo housing and piston rod yoke). Note this dimension.

an. With right pedal fully pressed, adjust right pedal stopbolt at front torque shaft lever installation until stop is contacted. Turn stop out in 1/2-turn increments while cycling pedals. Recheck dimension between adjustments until noted dimension is increased by 0.010 - 0.060 inch and tail rotor servo no longer bottoms.

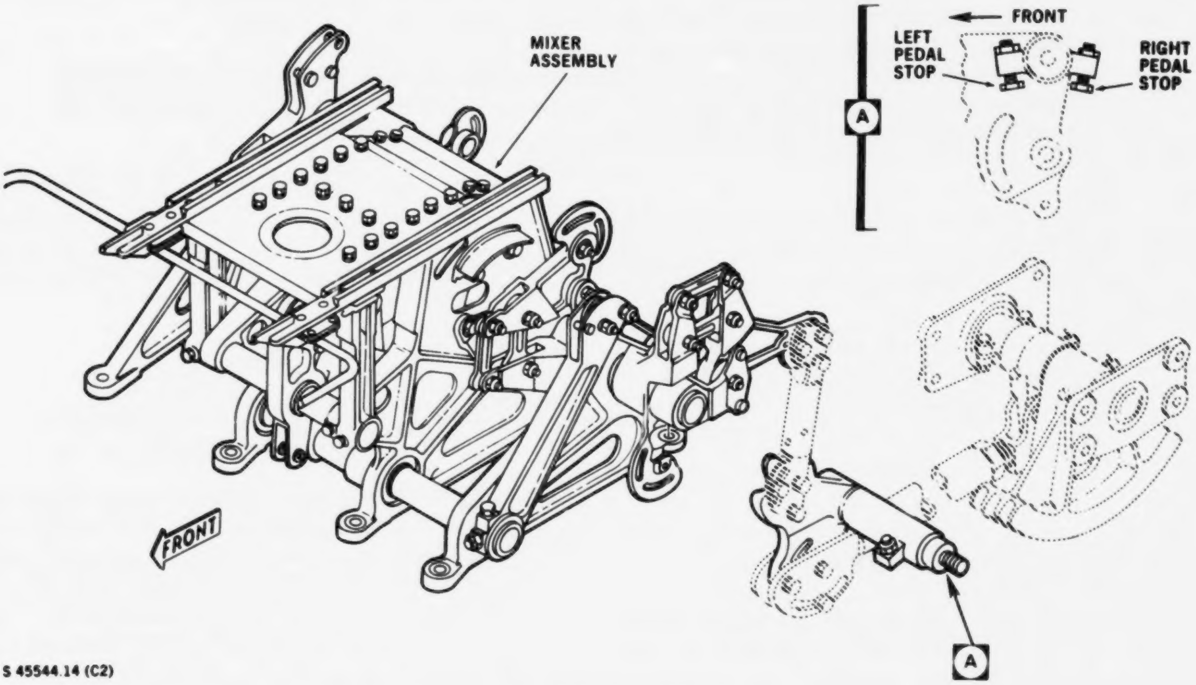

MIXER
ASSEMBLY
FRONT
LEFT
PEDAL
STOP
RIGHT
PEDAL
STOP
A
FRONT
A
S 45544.14 (C2)

FIGURE 11-18 (SHEET 6 OF 6)

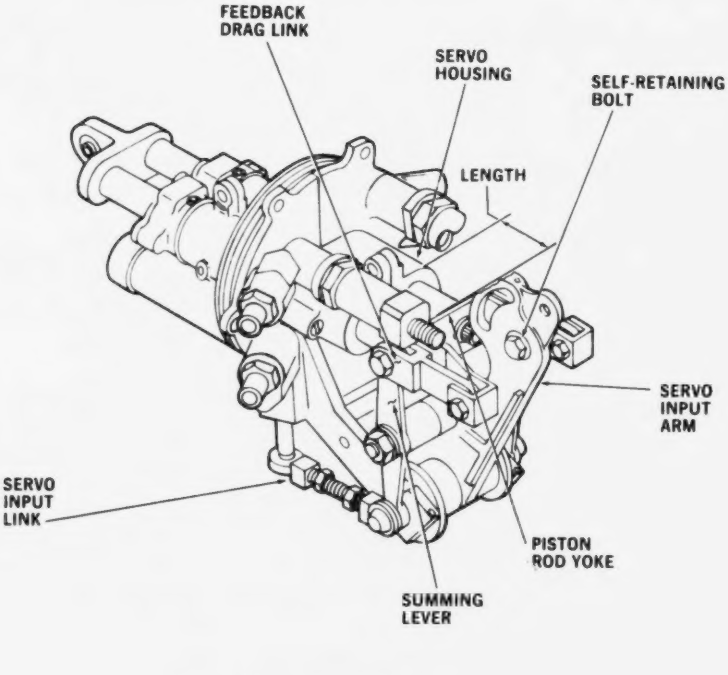

FEEDBACK
DRAG LINK
SERVO
HOUSING
SELF-RETAINING
BOLT
LENGTH
SERVO
INPUT
ARM
SERVO
INPUT
LINK
PISTON
ROD YOKE
SUMMING
LEVER
S 82071

FIGURE 11-19

11-2.4 RIGGING TAIL ROTOR 11-2.4

ao. **GAP BETWEEN SERVO HOUSING AND PISTON ROD YOKE WILL BE LESS THAN 0.090 INCH AT FULL RIGHT PEDAL AFTER ABOVE ADJUSTMENTS ARE PERFORMED.** Lockwire, Item 199, Appendix D, bolt.

ap. Connect spring cylinders to support at tail rotor quadrant (PARA 11-28).

aq. Do these QC checks:

(1) Yaw pedals stopbolts lockwired.

(2) No passage of 0.020-inch lockwire through control rod inspection holes.

(3) Turnbuckles safetied with locking clips.

(4) Cables, pulleys, and fair-leads for condition and proper routing.

(5) Remove all rigging pins in this order:

(a) 1 tail rotor servo rigging pin
(b) 1 mixer rigging pin
(c) 1 yaw boost servo rigging pin
(d) 1 collective boost servo rigging pin
(e) 1 yaw torque shaft rigging pin
(f) 2 yaw pedal adjuster rigging pins

(6) Do an operational check on tail rotor flight control system (TM 55-1520-237-T).

ar. Disconnect all hydraulic and electrical power.

as. Check area for cleanness and foreign material.

at. Replace baggage compartment soundproofing and cargo panels.

au. Close soundproofing panels, station 295 to 311.

av. Install tail gear box forward fairing.

aw. Close main rotor pylon sliding cover.

ax. Do a maintenance test flight (TM 55-1520-237-MTF).

11-2.5 ADJUST CYCLIC STICK BALANCE SPRING 11-2.5

a. Open main rotor pylon sliding cover.

b. Disconnect pitch input control rod at pitch torque shaft lever (PARA 11-27).

c. Remove soundproofing as required to work on balance springs in cabin overhead (PARA 2-32). Remove heater ducting to get to springs (PARA 13-2).

d. Pull cyclic stick full aft against stop. Let go of stick. Measure gap between cyclic stick and stop bolt. **GAP SHOULD BE 0.100 to 0.400 INCHES.**

e. If necessary, adjust inner and outer jamnuts at pitch balance spring bracket to hold gap dimension. Backing off inner jamnut and tightening outer jamnut increases spring tension, moving cyclic stick forward, when it is placed aft.

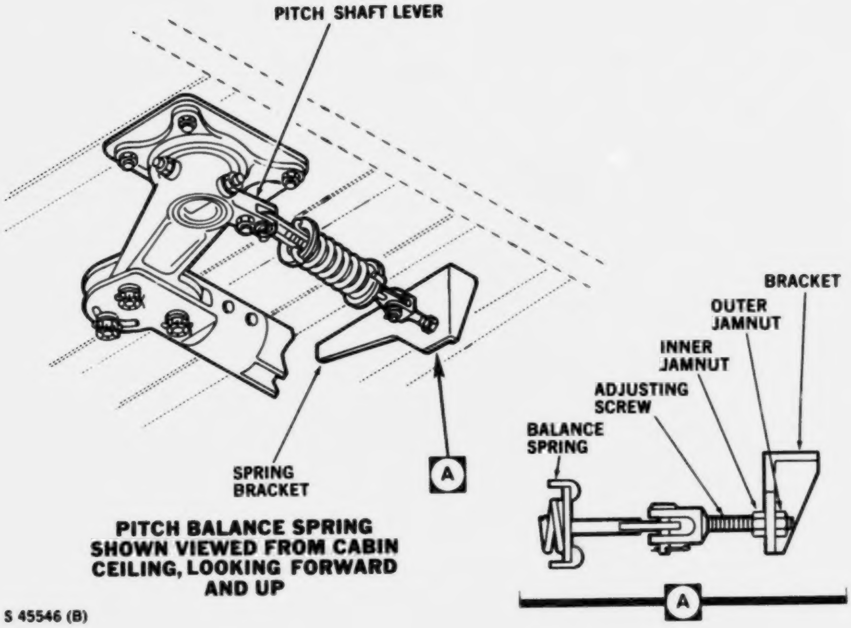
f. Check that cotter pins are installed in clevis pins.

g. Check area for cleanness and foreign material.

h. Reinstall heater ducting and soundproofing (PARAS 13-2 and 2-32).

i. Connect pitch input control rod (PARA 11-27).

j. Close main rotor pylon sliding cover.



PITCH BALANCE SPRING SHOWN VIEWED FROM CABIN CEILING, LOOKING FORWARD AND UP

FIGURE 11-20

11-2.6 ADJUST COLLECTIVE STICK BALANCE SPRING 11-2.6

a. Open main rotor pylon sliding cover.

b. Disconnect collective input control rod at collective torque shaft lever (PARA 11-27).

c. Place collective stick to about midposition. Make sure friction lock is completely backed off and does not drag on stick.

d. Collective stick should not creep up or down when placed in any position.

e. Remove soundproofing as required to work on torque shaft in cabin overhead (PARA 2-32). Remove heater ducting to get to spring more easily (PARA 13-2).

f. If necessary, adjust inner and outer jamnuts to hold collective stick in any position, with friction lock off.

g. Backing off inner jamnut and tightening outer jamnut increases spring tension, causing collective stick to raise. If adjusting screw interferes with airframe structure preventing proper adjustment, modify screw per PARA 11-21.

h. Raise collective fully up.

i. Check that front edge of the bar is at least 0.060 inch in side slot of retainer tube. If collective stick is adjusted and tie bar is too far towards front, replace spring, and readjust.

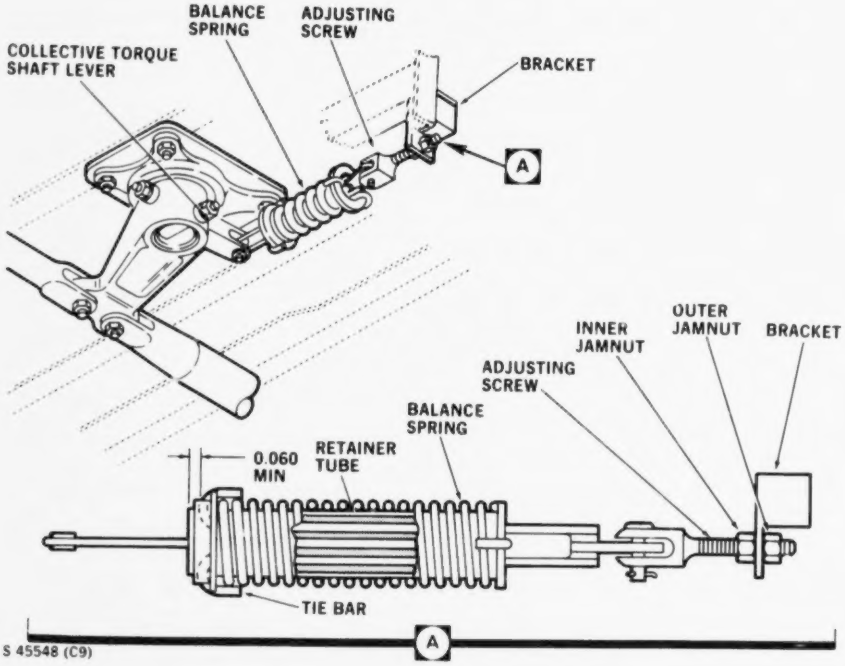

BALANCE SPRING
ADJUSTING SCREW
COLLECTIVE TORQUE SHAFT LEVER
BRACKET
A
OUTER JAMNUT
INNER JAMNUT
BRACKET
ADJUSTING SCREW
BALANCE SPRING
0.060 MIN
RETAINER TUBE
TIE BAR
A
S 45548 (C9)

FIGURE 11-21

11-2.6 ADJUST COLLECTIVE STICK BALANCE SPRING 11-2.6

j. Check that cotter pins are installed in clevis pins.

k. Connect collective input control rod at collective torque shaft lever (PARA 11-27).

l. Check area for cleanness and foreign material.

m. Reinstall heater ducting and soundproofing (PARAS 13-2, and 2-32).

n. Close main rotor pylon sliding cover.

11-3 YAW CONTROL PEDAL/PEDAL ADJUSTER 11-3

PARAGRAPH BREAKDOWN

11-3.1 REPLACE BOOTS
11-3.2 REPLACE TOE BRAKE PEDAL
11-3.3 REPLACE PEDAL TRIM SWITCH
11-3.4 REPLACE PEDAL SUPPORT ASSEMBLY
11-3.5 REPLACE PEDAL ADJUSTOR
11-3.6 REPLACE PEDAL ACTUATOR ADJUSTING CABLE AND HANDLE

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Corrosion Preventive Compound, Item 124, Appendix D
- Cotter Pin, MS24665-151
- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-374
- Cotter Pin, MS9245-31
- Lockwire, Item 199, Appendix D
- Tubing, Plastic, Spiral, Item 379, Appendix D
- Sealing Compound, Item 307, Appendix D
- Tiedown Strap, Item 359, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicator, MIL-I-18422
- Multimeter, AN/USM 223
- Retaining Pliers, GGG-P-480
- Tags for Wiring
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 700 - 1600 in. lbs, GGG-W-00686
- Torque Wrench, 100 - 500 ft lbs, GGG-W-00686

REFERENCES

- PARA 11-1
- TM 55-1500-204-25/1
- TM 55-1520-237-T

11-3.1 REPLACE BOOTS 11-3.1

REMOVE

NOTE

Removal procedures are the same for each of the pedal boots.

a. Turn off all electrical power.

b. Unzip boot.

c. Unscrew boot from floor panels around pedal.

d. Remove boot up and over pedal assembly and master cylinder.

INSTALL

e. Install boots so zippers face away from the center of individual pilot positions. Install boot over pedal assembly and master cylinder. Fasten to floor panels with screws and washers.

f. Zip up boot.

g. Check work area for tools, foreign material and cleanness.

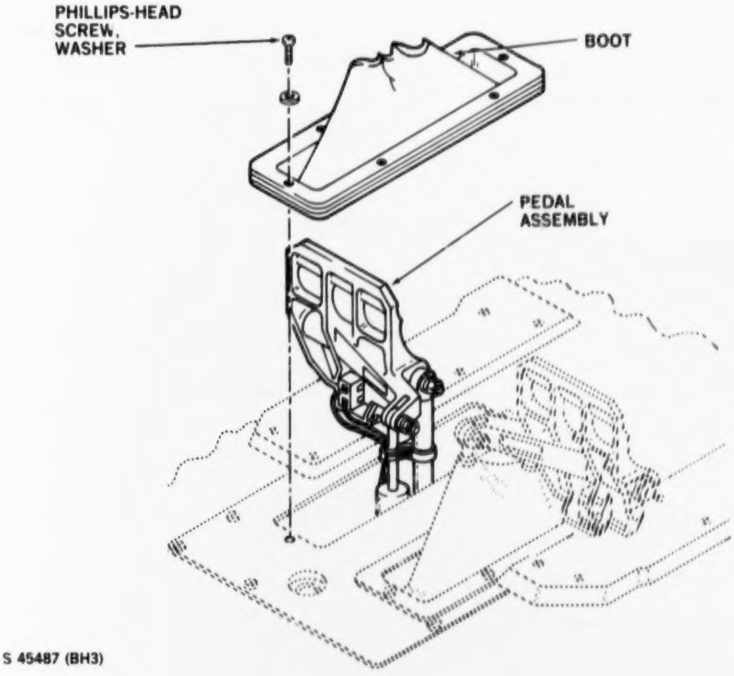


FIGURE 11-22

11-3.2 REPLACE TOE BRAKE PEDAL 11-3.2

a. Turn off all electrical power.

b. Remove switch attaching screws and remove switch from pedal. Carefully lower switch and wiring and let them hang from clamp.

c. Unbolt brake master cylinder from pedal clevis.

d. Remove bolts or nuts and pull pedal assembly from pedal support.

e. Install replacement pedal assembly in pedal support.

f. On support assembly, 70400-01604-043, install bolt. **TORQUE BOLT TO 123 - 135 FOOT-POUNDS.** Lockwire, Item 199, Appendix D, bolt to pedal support.

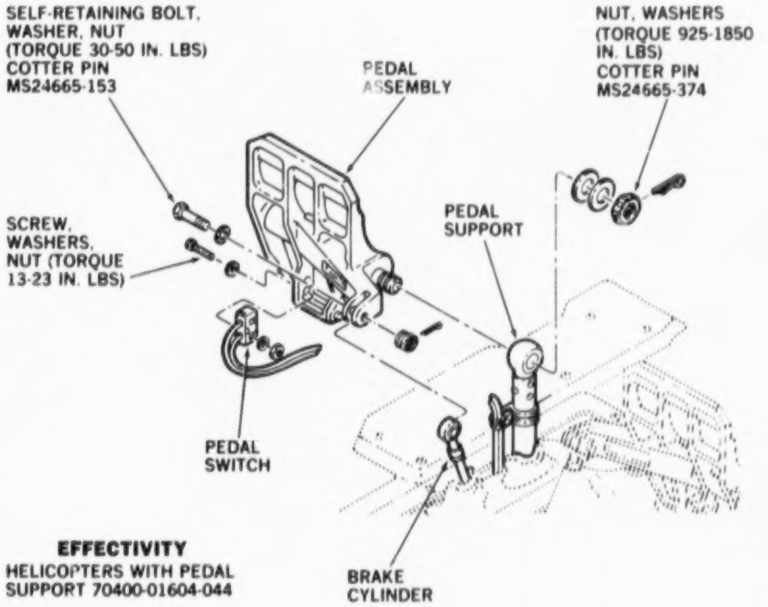
g. On support assembly, 70400-01604-044, install nut. **TORQUE NUT TO 925 - 1850 INCH-POUNDS.** Install cotter pin, MS24665-374.

h. On support assembly, 70400-01604-049, remove bolts, washers, and nuts. Lift pedal half of support from support assembly.

i. Remove retaining ring using retaining ring pliers. Slide washer, wave washer, washer, and pedal from support. If required remove washer and retaining ring from support.

j. If removed, install retaining ring and washer on support.

k. Slide replacement pedal, washer, wave washer, and washer on support. Install retaining ring using retaining ring pliers.


SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PEDAL ASSEMBLY
NUT, WASHERS (TORQUE 925-1850 IN. LBS) COTTER PIN MS24665-374
SCREW, WASHERS, NUT (TORQUE 13-23 IN. LBS)
PEDAL SUPPORT
PEDAL SWITCH
EFFECTIVITY
HELICOPTERS WITH PEDAL SUPPORT 70400-01604-044
BRAKE CYLINDER

S 134010 (BH3)

FIGURE 11-23

11-3.2 REPLACE TOE BRAKE PEDAL 11-3.2

l. Assemble support halves and line up boltholes. Install bolts, washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** Install cotter pin, MS24665-153.

m. Install brake master cylinder in pedal clevis.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

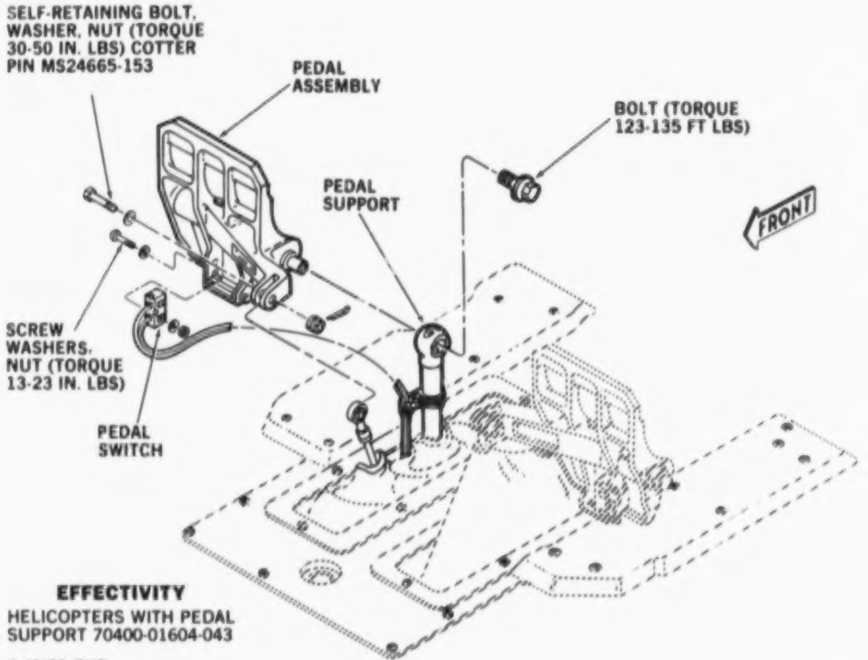
n. Install self-retaining bolt and washers (under head) (PARA 11-1).

o. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

p. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

q. Install switch on pedal and install screws, washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.**

r. Check area for foreign material and cleanness.

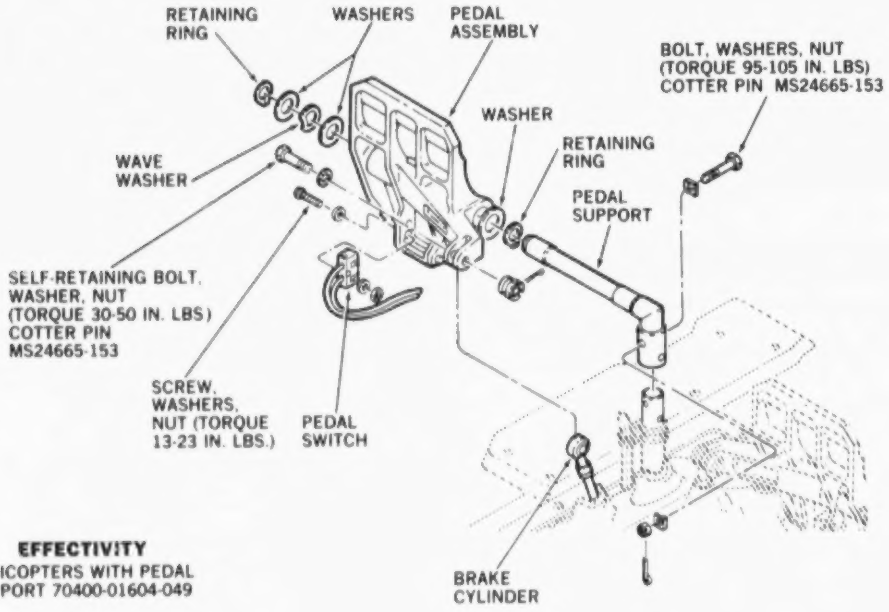

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PEDAL ASSEMBLY
BOLT (TORQUE 123-135 FT LBS)
PEDAL SUPPORT
FRONT
SCREW WASHERS, NUT (TORQUE 13-23 IN. LBS)
PEDAL SWITCH

EFFECTIVITY
HELICOPTERS WITH PEDAL SUPPORT 70400-01604-043

S 45488 (BH3)

FIGURE 11-24

11-3.2 REPLACE TOE BRAKE PEDAL 11-3.2


RETAINING RING
WASHERS
PEDAL ASSEMBLY
BOLT, WASHERS, NUT (TORQUE 95-105 IN. LBS) COTTER PIN MS24665-153
WASHER
RETAINING RING
WAVE WASHER
PEDAL SUPPORT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SCREW, WASHERS, NUT (TORQUE 13-23 IN. LBS.)
PEDAL SWITCH
BRAKE CYLINDER

EFFECTIVITY
HELICOPTERS WITH PEDAL
SUPPORT 70400-01604-049

S 134011 (BH3)

FIGURE 11-25

11-3.3 REPLACE PEDAL TRIM SWITCH 11-3.3

a. Turn off all electric power.

b. Remove screws, washers, and nuts, and remove switch. Slide enclosure back on wires.

c. Tag wires and disconnect them from switch.

d. Remove enclosure from wires.

e. Install replacement switch against support in pedal and loosely install screws, washers, and nuts. Slide enclosure on wires.

f. Connect electrical wiring to replacement switch. Remove tags from wire. Place switch enclosure over switch, then install attaching screws, washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.**

g. Using a multimeter, check that switch operates when pedal actuator is pushed down.

h. Check area for foreign material and cleanness.

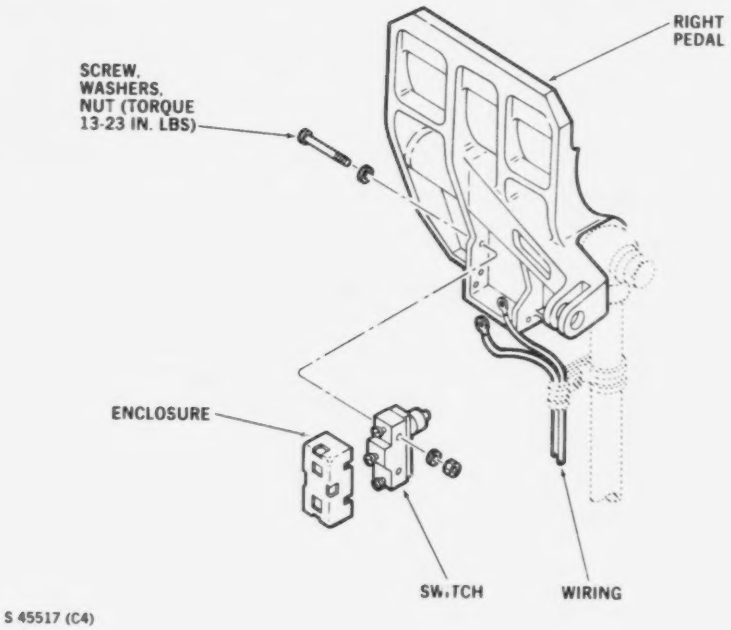

RIGHT PEDAL
SCREW, WASHERS, NUT (TORQUE 13-23 IN. LBS)
ENCLOSURE
SWITCH
WIRING
S 45517 (C4)

FIGURE 11-26

11-3.4 REPLACE PEDAL SUPPORT ASSEMBLY 11-3.4

REMOVE

a. Turn off all electrical power.

b. Remove left and right boots (PARA 11-3.1).

c. Remove floor panel around pedal assembly.

d. Tag switch for left or right pedal. Remove screws and remove switch from pedal.

e. Remove clamps and wiring from pedal supports.

NOTE

It is not necessary to disconnect hydraulic lines from master cylinders.

f. Unbolt both master cylinders from pedal control and master cylinder support arms. Move cylinders aside. Do not let cylinders hang by hoses.

g. Remove directional control rods from pedal supports.

h. Unbolt support assembly from floor beams.

i. Slide pedal support assembly out from between floor beams.

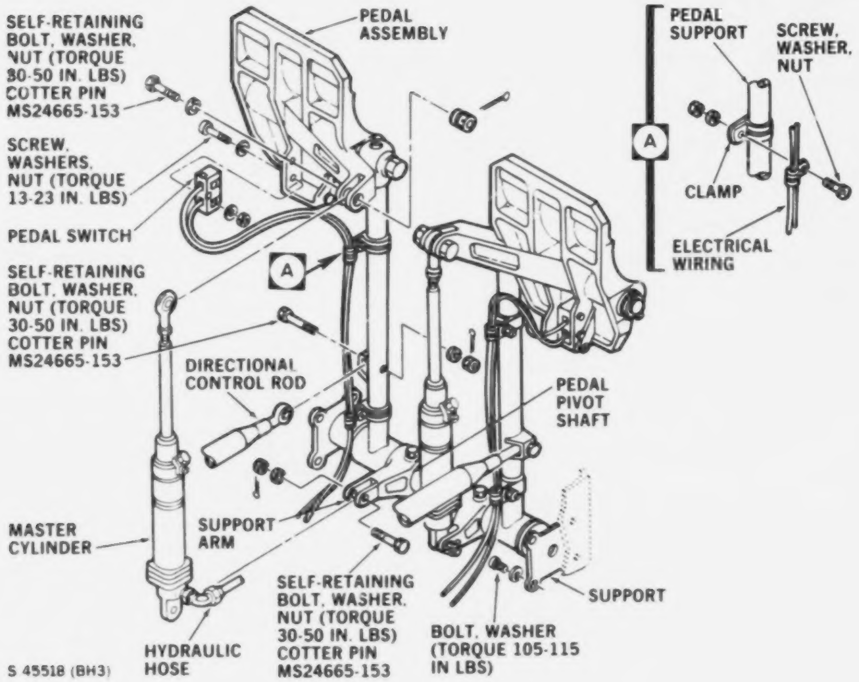

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PEDAL ASSEMBLY
PEDAL SUPPORT
SCREW, WASHER, NUT
A
SCREW, WASHERS, NUT (TORQUE 13-23 IN. LBS)
CLAMP
PEDAL SWITCH
A
ELECTRICAL WIRING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
DIRECTIONAL CONTROL ROD
PEDAL PIVOT SHAFT
MASTER CYLINDER
SUPPORT ARM
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SUPPORT
BOLT, WASHER (TORQUE 105-115 IN LBS)
HYDRAULIC HOSE
S 45518 (BH3)

FIGURE 11-27

11-3.4 REPLACE PEDAL SUPPORT ASSEMBLY 11-3.4

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

j. Install pedal assembly and support between floor beams. Install bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

k. Bolt directional control rods to pedal support.

l. Install self-retaining bolt and washers (under head) (PARA 11-1).

m. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

n. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

o. Bolt master cylinders between support arm and pedal assembly.

p. Install self-retaining bolt and washers (under head) (PARA 11-1).

q. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

r. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

WARNING

Make sure right pedal operates right main wheel brake, and left pedal operates left main wheel brake.

s. Remove tags and install pedal switch on pedal and install screws, washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.**

t. Clamp wiring to pedal supports.

u. Do operational check of pedal switches (TM 55-1520-237-T).

v. Check area for foreign material and cleanness.

w. Install floor panel around pedal assembly.

x. Install boots (PARA 11-3.1).

11-3.5 REPLACE PEDAL ADJUSTOR 11-3.5

REMOVE

a. Remove screws and cover over directional control rod.

b. Unbolt directional control rod from pedal adjustor arm.

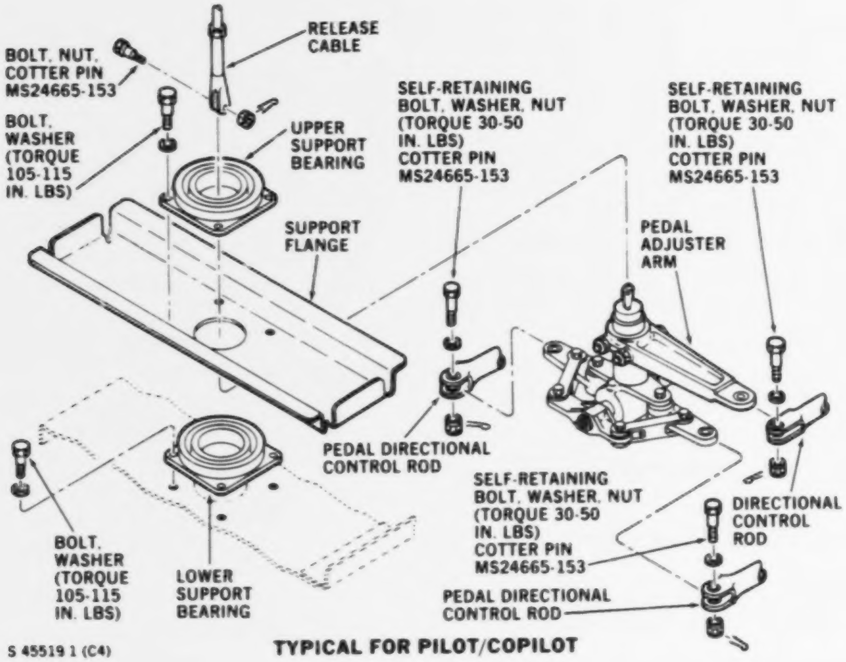
c. Unbolt directional control rods from pedal adjustor links.

d. Unbolt and remove release cable from pedal adjustor.

e. Unbolt upper and lower support bearings from support.

f. Remove adjustor and support bearings from between airframe supports. Remove bearing supports from actuator.

g. Check support bearings for freedom of operation (TM 55-1500-204-25/1). Replace if necessary.


RELEASE CABLE
BOLT, NUT, COTTER PIN MS24665-153
BOLT, WASHER (TORQUE 105-115 IN. LBS)
UPPER SUPPORT BEARING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SUPPORT FLANGE
PEDAL ADJUSTER ARM
PEDAL DIRECTIONAL CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
DIRECTIONAL CONTROL ROD
BOLT, WASHER (TORQUE 105-115 IN. LBS)
LOWER SUPPORT BEARING
PEDAL DIRECTIONAL CONTROL ROD

S 45519 1 (C4)

TYPICAL FOR PILOT/COPILOT

FIGURE 11-28 (SHEET 1 OF 3)

11-3.5 REPLACE PEDAL ADJUSTOR 11-3.5

INSPECT

h. Inspect bearings, MKP21BSA1173 or MKP21BS-400, in upper and lower support using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

i. Inspect bearings in small arm and links using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

j. Inspect bearing in long arm using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.025 INCH.**

DISASSEMBLE

k. Remove bolts from rigid links and small arm.

l. Remove small arm from shaft of pedal adjustor, being careful not to lose key from shaft.

m. Unbolt and remove rigid links from links.

n. Remove links from pedal adjustor.

ASSEMBLE

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

o. Connect links to pedal adjustor.

p. Install self-retaining bolts and washers (under bolthead) (PARA 11-1).

q. Install nut on bolt. **TORQUE NUTS TO 60 - 100 INCH-POUNDS.** Install cotter pins, MS24665-153.

r. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

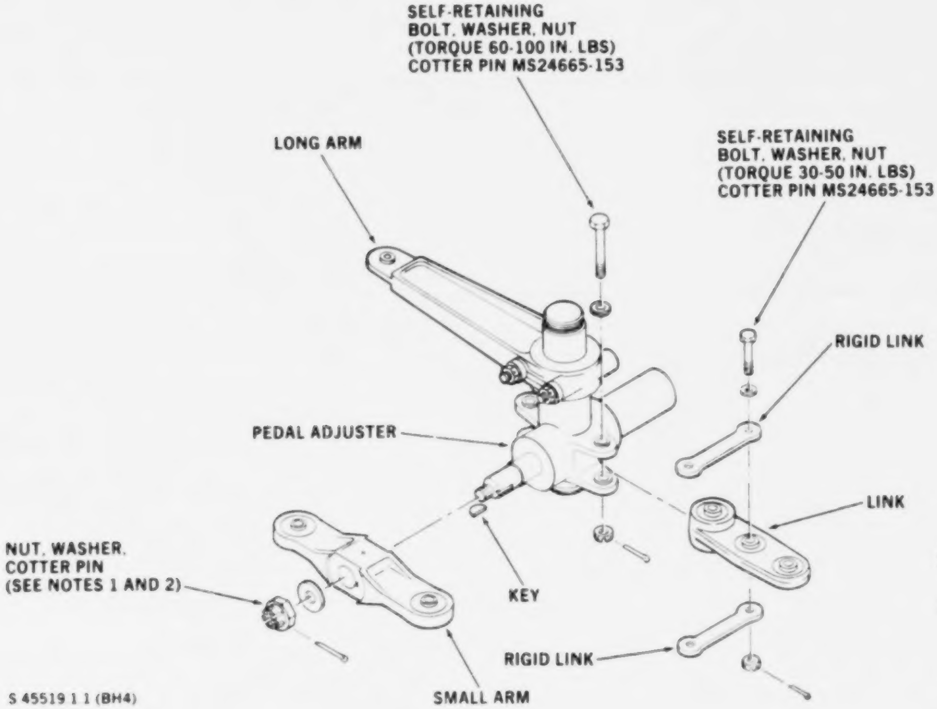
s. Connect rigid links to links.

t. Install self-retaining bolts and washers (under bolthead) (PARA 11-1).

u. Install nut on bolt. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

v. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-3.5 REPLACE PEDAL ADJUSTOR 11-3.5


SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 60-100 IN. LBS)
COTTER PIN MS24665-153
LONG ARM
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN MS24665-153
RIGID LINK
PEDAL ADJUSTER
LINK
NUT, WASHER,
COTTER PIN
(SEE NOTES 1 AND 2)
KEY
RIGID LINK
SMALL ARM
S 45519 1 1 (BH4)

NOTES

1. TORQUE NUT, MS17825-6 TO 100-165 INCH-POUNDS.
2. TORQUE NUT 70400-01625-103 TO 95-100 INCH-POUNDS. (IF HOLE IN BOLT DOES NOT ALIGN WITH NUT, TIGHTEN NUT ONE CASTELLATION.)

FIGURE 11-28 (SHEET 2 OF 3)

INSTALL

CAUTION

There are two different types of washers and nuts used to retain small arm on shaft. Do not mix washers and nuts and make sure correct torque is used when torquing nuts.

w. Position key in slot of shaft and slide small arm on shaft. Install washer, MS27183-13, and nut, MS17825-6; or washer, 70400-01625-102, and nut, 70400-01625-103. **TORQUE NUT, MS17825-6 TO 100 - 165 INCH-POUNDS.** Install cotter pin, MS9245-28. **TORQUE NUT, 70400-01625-103 TO 95 - 105 INCH-POUNDS. IF BOLTHOLE DOES NOT LINE UP WITH NUT, TIGHTEN NUT ONE CASTELLATION.** Install cotter pin, MS9245-31.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

x. Install lower support bearing on helicopter with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

y. Place adjustor in lower bearing.

11-3.5 REPLACE PEDAL ADJUSTOR 11-3.5

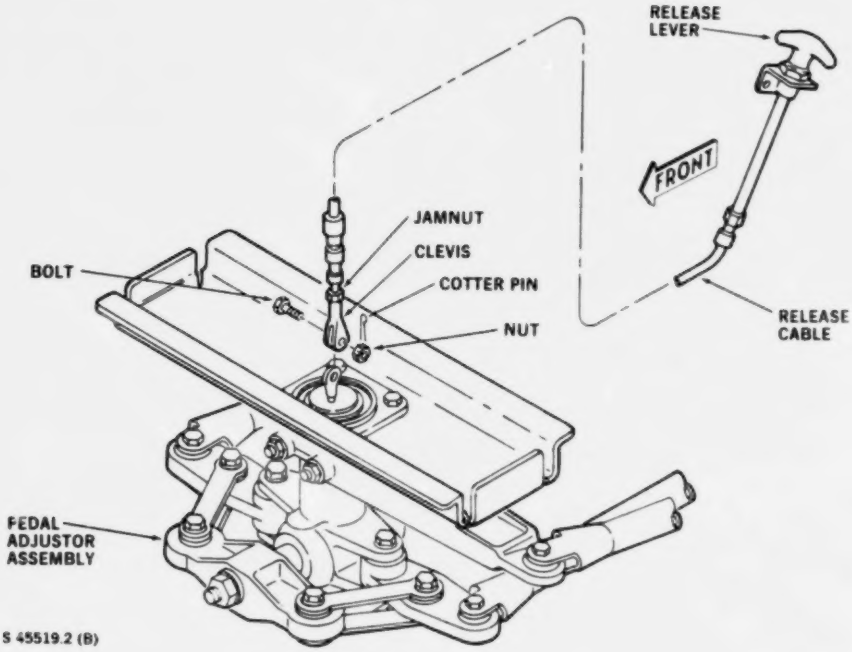

RELEASE LEVER
FRONT
JAMNUT
CLEVIS
BOLT
COTTER PIN
NUT
RELEASE CABLE
PEDAL ADJUSTOR ASSEMBLY
S 45519.2 (B)

FIGURE 11-28 (SHEET 3 OF 3)

z. Install upper bearing support with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

aa. Check adjustor endplay (up and down). **MAXIMUM ENDPLAY ALLOWED IS 0.040 INCHES.** If endplay is greater than 0.040 inches, shim lower bearing support with washers.

ab. Connect directional control rod to pedal adjustor arm.

ac. Install self-retaining bolt and washers (under head) (PARA 11-1).

ad. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ae. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

af. Connect pedal directional control rods to pedal adjustor links.

ag. Install self-retaining bolt and washers (under head) (PARA 11-1).

ah. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

11-3.5 REPLACE PEDAL ADJUSTOR

ai. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aj. Bolt release cable to pedal adjustor actuator. **TIGHTEN NUT ONLY HANDTIGHT.** Install cotter pin, MS24665-153.

CHECKOUT

ak. Push pedals fully to the front.

al. Lock release lever. Pedals will stay.

am. Pull release lever out to unlock. Pedals will move back toward you.

an. If pedals do not operate properly, do this:

(1) Unlock pedals.

(2) Unbolt clevis from adjustor.

(3) Release jamnut on clevis end of cable.

(4) Adjust clevis to shorten or lengthen release cable. Shorten clevis to tighten cable; lengthen clevis to loosen cable.

(5) Install bolt to hold clevis to adjustor. Install nut only handtight. Install cotter pin, MS24665-153.

ao. Check pedals again.

ap. Check area for cleanness and foreign material.

aq. Install floor panels around pedal assembly.

ar. Install boots (PARA 11-3.1).

as. Install cover over directional control rod and adjustor arm with screws.

11-3.6 REPLACE PEDAL ACTUATOR ADJUSTING CABLE AND HANDLE 11-3.6

a. Unbolt clevis from actuator rod end.

b. Remove clamps from airframe brackets.

c. Remove release lever bracket and spacer from instrument panel.

d. To replace handle, do this:

  (1) Loosen setscrew in handle and remove handle from cable.

  (2) Place a light coat of corrosion preventive compound, Item 124, Appendix D, on threads of cable.

  (3) Install handle on cable.

  (4) Place a light coat of sealing compound, Item 307, Appendix D, on threads of setscrew. Install setscrew in handle until seated against cable.

e. Install nonmetallic tubing on cable where it contacts support on end of instrument panel. Install tiedown straps, Item 359, Appendix D, on each end of nonmetallic tubing.

f. Place clamps on cable.

g. Place spacer under release lever bracket and install bracket and spacer on support end of instrument panel, using screws.

h. Install clamps and cable on airframe brackets using screws and washers.

i. Connect clevis to actuator rod end using bolt, washers, and nut. Install cotter pin, MS24665-151.

j. Check cable operation and clevis adjustment (PARA 11-3.5).

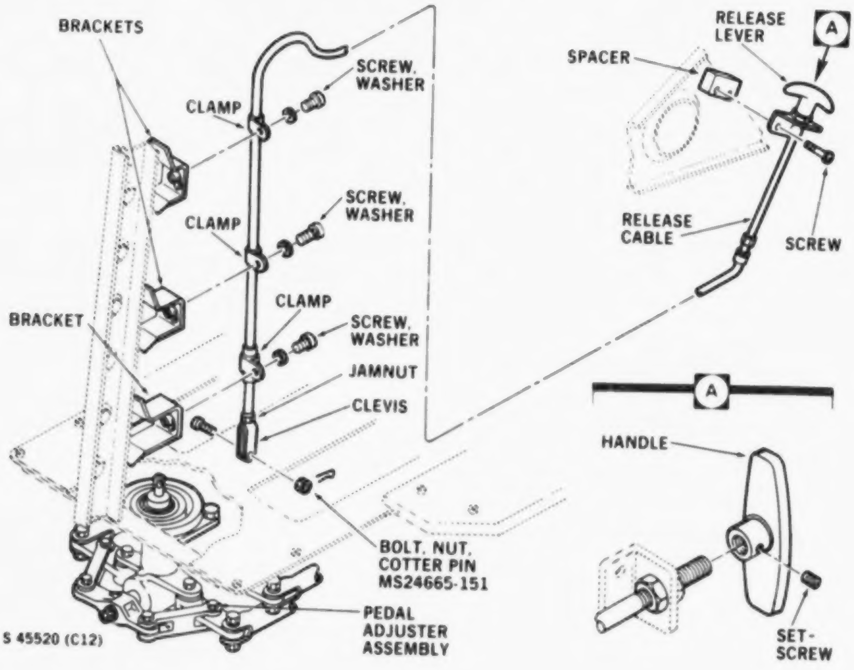

BRACKETS
CLAMP
SCREW, WASHER
CLAMP
SCREW, WASHER
CLAMP
SCREW, WASHER
BRACKET
JAMNUT
CLEVIS
BOLT, NUT, COTTER PIN MS24665-151
PEDAL ADJUSTER ASSEMBLY
S 45520 (C12)
SPACER
RELEASE LEVER
A
RELEASE CABLE
SCREW
A
HANDLE
SET-SCREW

FIGURE 11-29

11-4 YAW CONTROL PEDAL/PEDAL ADJUSTER - REPAIR (AVIM) 11-4

PARAGRAPH BREAKDOWN

11-4.1	REPAIR TOE PEDAL (AVIM)
11-4.2	REPLACE PEDAL SUPPORT BEARINGS (AVIM)
11-4.3	REPAIR YAW PEDAL SUPPORT (AVIM)
11-4.4	REPLACE PEDAL ADJUSTER BEARINGS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68D - Aircraft Powertrain Repairer
- One: MOS 68G - Aircraft Structural Repairer

MATERIALS/PARTS

- Bolt and Nut, 5/8 - 18
- Cotter Pin, MS24665-153
- Degreasing Solvent, Item 131, Appendix D
- Epoxy Primer, Item 150, Appendix D
- Grease, Item 168, Appendix D
- Lacquer, Item 191, Appendix D
- Loctite, Grade B, Item 208, Appendix D
- Loctite, Item 398, Appendix D
- Masking Tape, Item 228, Appendix D
- Paint Remover, Item 255, Appendix D
- Rivets, MS20426AD4
- Surface Primer, Grade T, Item 333, Appendix D
- Trichloroethylene, Item 376, Appendix D
- Zinc Chromate Primer, Item 279, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Airframe Repairer's Toolkit, SC 5180-99-CL-A02
- Arbor Press, OO-P-636
- Dial Indicator, MIL-I-18422
- Drill Bit, #14
- Fluorescent Penetrant Inspection Kit, XMA-101
- Pneumatic Drill, OO-D-691
- Pneumatic Hammer, 00-R-421
- Pneumatic Rivet Setting Tool, GGG-R-425
- Powertrain Repairer's Toolkit, SC 5180-99-CL-A13
- Puller Set, GGG-P-781
- Reamer Set GGG-R-00180
- Retaining Pliers, GGG-P-480
- Size Block, 0.344-0.346 inch, Locally-Made
- Size Block, 0.375-0.376 inch, Locally-Made
- Torque Wrench, 0 - 30 in. oz, GGG-W-00686
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Twist Drill Set, GGG-D-751
- Torque Wrench, 0 - 16 in. oz, TQSS008A

REFERENCES

- PARA 2-5
- TM 55-1500-335-23

11-4.1 REPAIR TOE PEDAL (AVIM) 11-4.1

DISASSEMBLE

a. Remove screws, washers, and nuts, and remove switch from pedal.

b. Remove actuator screw, nut, spacer, and spring from pedal and actuator. Remove screw, washer, and nut, and remove actuator from pedal. Remove flanged bushings from actuator.

c. Remove retaining ring and shim(s) from pivot. Remove pivot from pedal. Remove washer from pivot.

d. Using bearing puller, remove bearings from pedal.

e. Using arbor press and driver, remove bushings from pedal arm clevis.

f. Clean parts, except bearings, with degreasing solvent, Item 131, Appendix D.

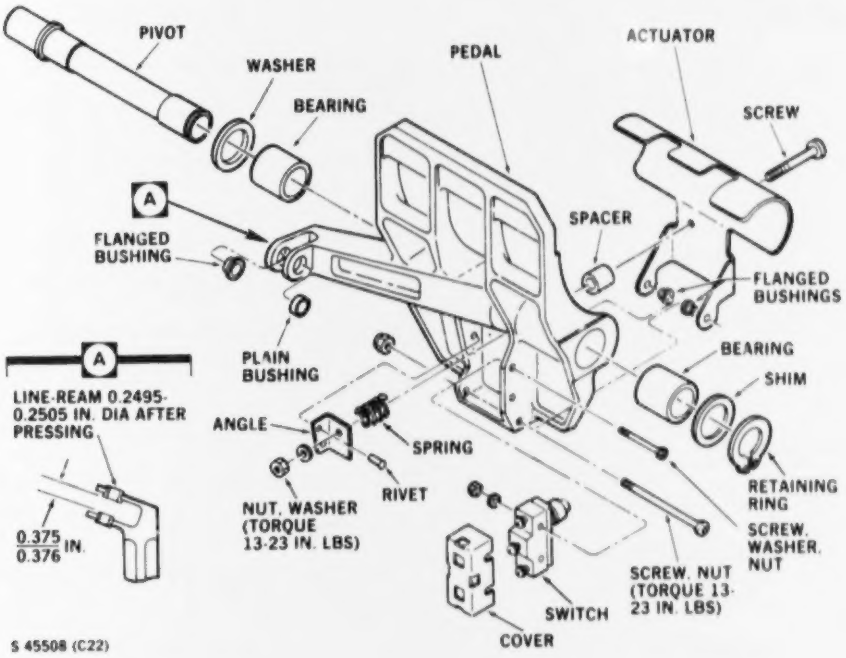

PIVOT
WASHER
BEARING
PEDAL
ACTUATOR
SCREW
A
FLANGED BUSHING
SPACER
FLANGED BUSHINGS
PLAIN BUSHING
BEARING
SHIM
A
LINE-REAM 0.2495-0.2505 IN. DIA AFTER PRESSING
ANGLE
SPRING
RIVET
RETAINING RING
NUT, WASHER (TORQUE 13-23 IN. LBS)
SCREW, WASHER, NUT
0.375/0.376 IN.
SCREW, NUT (TORQUE 13-23 IN. LBS)
SWITCH
COVER
S 45508 (C22)

FIGURE 11-30

11-4.1 REPAIR TOE PEDAL (AVIM) 11-4.1

INSPECT/REPAIR

g. Inspect screws for damage to threads.

h. Using paint remover, Item 255, Appendix D, remove paint from all painted parts.

i. Inspect actuator. Replace if bent or cracked.

j. Inspect parts for wear, cracks, elongated holes in bushings or attaching holes.

k. Fluorescent penetrant inspect pedal (TM 55-1500-335-23).

l. Inspect areas around bushings and bearings, and pedal arm clevis for cracks. Replace if necessary.

m. Using degreasing solvent, Item 131, Appendix D, clean pedal and pivot. Blow dry with dry compressed air.

n. Magnetic particle inspect pivot for cracks in all groove areas (TM 55-1500-335-23). Replace if necessary.

o. If necessary to replace actuator angle bracket, drill out two rivets using #14 (0.182-inch diameter) drill bit. Be careful not to elongate holes. Rivet new bracket in place with MS20426AD4 rivets.

p. Using masking tape, Item 228, Appendix D, mask pedal bearing bores and bushing holes in clevis arm. Mask all surfaces of pivot except shoulder.

q. Using epoxy primer, Item 150, Appendix D and lacquer, Item 191, paint pedal and pivot.

r. Using zinc chromate primer, Item 279, Appendix D, paint flanged and plain bushing outer surface. Using arbor press, and with primer still wet, install flanged bushing into pedal.

s. Insert a 0.375- to 0.376-inch size block over bushing flange, before installing plain bushing.

t. Using arbor press, install plain bushing. Measure space between ends of installed bushings. **CLEARANCE SHALL BE 0.375-0.376 INCH.**

u. Line-ream bushing holes to 0.2495-0.2505 inch.

CAUTION

Do not get primer, solvent, or loctite, Item 333, Appendix D, in bearings.

v. Apply a light coat of surface primer loctite, grade T, Item 333, Appendix D, to OD of bearing and ID of pedal bores. Allow to air-dry for at least 30 seconds.

NOTE

Surface primer and loctite must be made by same manufacturer.

w. Apply about 1/16-inch bead of loctite, grade B, Item 208, Appendix D, to leading edge of bearing outside diameter and leading edge of pedal bore. Beads shall be all around edges.

11-4.1 REPAIR TOE PEDAL (AVIM) 11-4.1

x. Within 10 minutes after applying loctite, press bearings into pedal using arbor press. Be careful not to get compound in bearings.

y. Using a cloth damp with degreasing solvent Item 131, Appendix D, wipe surfaces of bearings clean of any loctite. Be careful not to get solvent in bearings.

z. Allow at least 10 minutes for loctite to dry before handling pedal.

NOTE

Loctite exposed to air (external to mating surfaces) will not dry.

ASSEMBLE

aa. Install flanged bushings in actuator with flanges on inside. Position actuator through pedal.

ab. Install long screw, and nut through actuator and pedal. **TORQUE NUT TO 13 - 23 INCH-POUNDS.**

ac. Install spring on spacer and place spacer and spring between actuator and angle bracket.

ad. Install screw through actuator, spacer, and angle. Install washer and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.**

ae. Install washer on pivot. Install pivot and washer into pedal. Install shim and retaining ring on pivot. Measure gap between shim and retaining ring using feeler gage. **ALLOWABLE GAP IS 0.001 -0.005 INCH.** Add or subtract shims until gap is achieved.

af. Install a 5/8 - 18 thread bolt, with a jamnut, in end of pivot. Tighten jamnut.

ag. Using torque wrench, measure rotational drag on bearings in pedal. **REPLACE BEARINGS IF TORQUE TO TURN PIVOT IN PEDAL IS MORE THAN 5 INCH-OUNCES.**

ah. Remove bolt and nut from pivot.

11-4.2 REPLACE PEDAL SUPPORT BEARINGS (AVIM) 11-4.2

DISASSEMBLE

a. Unbolt left shaft support from shaft. Remove concave washers. Remove left shaft support.

b. On helicopters with support, 70450-01604-042, remove retaining ring and washers. Slide pedal supports from shaft.

c. On helicopters with support, 70450-01604-044, remove retaining rings and shims. Slide pedal supports from shaft.

NOTE

Tag and identify each shim as to location from which removed for ease on installation.

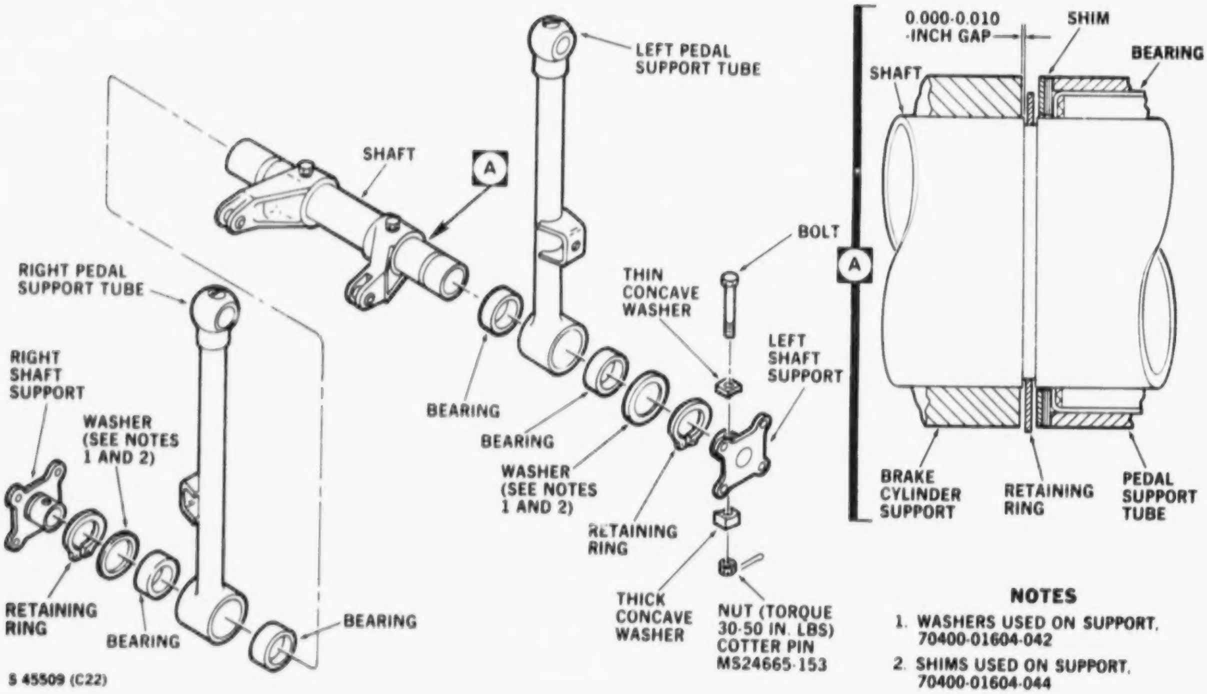
d. Using bearing puller, remove bearings from supports.

INSPECT/REPAIR

e. Clean pedal support, except bearings, with degreasing solvent, Item 131, Appendix D. Blow dry with dry compressed air.

f. Magnetic particle inspect pedal support and check for cracks in bearing area and welds at control rod attaching point (TM 55-1500-335-23). Replace support if necessary.

g. Inspect left and right pedal support tube bearings using a dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**


LEFT PEDAL SUPPORT TUBE
SHAFT
A
RIGHT PEDAL SUPPORT TUBE
RIGHT SHAFT SUPPORT
WASHER (SEE NOTES 1 AND 2)
BEARING
BEARING
WASHER (SEE NOTES 1 AND 2)
RETAINING RING
BOLT
THIN CONCAVE WASHER
LEFT SHAFT SUPPORT
RETAINING RING
BEARING
BEARING
THICK CONCAVE WASHER
NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
0.000-0.010 -INCH GAP
SHIM
SHAFT
BEARING
A
BRAKE CYLINDER SUPPORT
RETAINING RING
PEDAL SUPPORT TUBE
S 45509 (C22)

NOTES

1. WASHERS USED ON SUPPORT, 70400-01604-042
2. SHIMS USED ON SUPPORT, 70400-01604-044

FIGURE 11-31

11-4.2 REPLACE PEDAL SUPPORT BEARINGS (AVIM) 11-4.2

ASSEMBLE

CAUTION

Do not get solvent, surface primer or loctite in bearings.

h. Apply a light coat of surface primer, Grade T, Item 333, Appendix D, to OD of bearing and ID of pedal support bores. Allow to air-dry for at least 30 seconds.

NOTE

Surface primer and loctite must be made by same manufacturer.

i. Before installing bearings, purge bearings and then hand pack with grease, Item 168, Appendix D. Clean OD of bearings with rag wet with degreasing solvent, Item 131, Appendix D. Be careful not to get solvent in bearings.

j. Apply about a 1/16-inch bead of loctite, Grade B, Item 208, Appendix D, to leading edge of bearing outside diameter and leading edge of support bore. Bead should be all around edges.

k. Within 10 minutes after applying loctite, press bearings in support.

l. Press bearings into left and right supports, using arbor press. Each bearing must be seated flush to 0.010 inch below edge of support bore. Be careful not to get loctite in bearings.

m. Using a cloth damp with degreasing solvent Item 131, Appendix D, wipe surfaces of bearing clean of any loctite. Be careful not to get degreasing solvent in bearings.

n. Allow at least 10 minutes for loctite to dry before handling supports.

NOTE

Loctite exposed to air (external to mating surfaces) will not dry.

o. On helicopters with support, 70400-01604-042, do this:

   (1) Install right pedal support tube on shaft. Install washer and retaining ring.

   (2) Install left pedal support tube in shaft. Install washer and retaining ring on shaft.

p. Install left shaft support in shaft; line up bolt holes.

q. Install thin concave washer on bolt, flat side toward head. Install through left shaft support.

r. On helicopters with support, 70400-01604-044, do this:

   (1) Install shim(s) and right/left pedal support tube on shaft. Install shim(s) and retaining ring. Remove tags from shim(s).

   (2) If original shim(s) are not available, temporarily, install right/left pedal support and right/ left shaft support. Measure gap between brake cylinder support and retaining ring.

   (3) Split shims evenly on both sides of pedal support to obtain a gap of 0.000 - 0.010 inch.

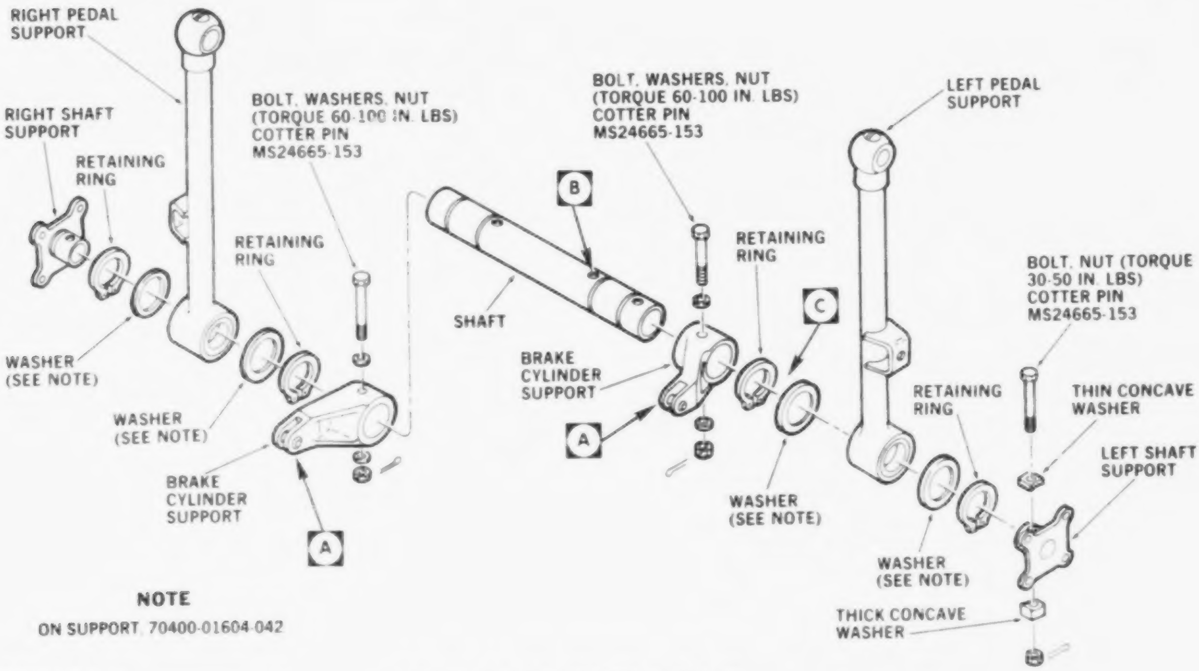
   (4) Remove right/left pedal support and right/left shaft support.

   (5) Install shim(s), right/left pedal support, shim(s) and retaining rings.

s. Install thick concave washer on bolt, curved side toward support. Install nut. **TORQUE NUT TO 30 - 50 INCH POUNDS.** Install cotter pin, MS24665-153.

t. Install right support in shaft. Tie to pedal support so it will not fall out.

11-4.3 REPAIR YAW PEDAL SUPPORT (AVIM) 11-4.3


RIGHT PEDAL SUPPORT
RIGHT SHAFT SUPPORT
RETAINING RING
BOLT, WASHERS, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-153
RETAINING RING
WASHER (SEE NOTE)
WASHER (SEE NOTE)
BRAKE CYLINDER SUPPORT
A
SHAFT
B
BOLT, WASHERS, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-153
BRAKE CYLINDER SUPPORT
A
RETAINING RING
C
LEFT PEDAL SUPPORT
BOLT, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
RETAINING RING
THIN CONCAVE WASHER
LEFT SHAFT SUPPORT
WASHER (SEE NOTE)
WASHER (SEE NOTE)
THICK CONCAVE WASHER

NOTE

ON SUPPORT, 70400-01604-042

S 45510.1 (C22)

FIGURE 11-32 (SHEET 1 OF 2)

DISASSEMBLE

a. Unbolt left shaft support from shaft. Remove special washers.

b. On helicopters with support, 70400-01604-042, remove washer and retaining ring. Remove pedal support from shaft. Remove washer and retaining ring from each end of shaft.

c. On helicopters with support, 70400-01604-044, remove shim(s) and retaining ring, remove pedal support from shaft. Remove shim(s) and retaining rings from each end of shaft.

NOTE

Tag and identify each shim as to location from which removed for ease on installation.

d. Unbolt brake cylinder supports and slide from shaft.

e. Using paint remover, Item 255, Appendix D, strip paint from shaft and brake cylinder supports.

f. Visually inspect shaft scoring for nicks on bearing areas. Check for elongated holes.

g. Visually inspect supports for elongated bushing holes, and elongated bolt holes.

h. If necessary, use an arbor press and bushing driver, and press bushings from support clevis ears.

i. Magnetic particle inspect shaft and brake cylinder supports (TM 55-1500-335-23).

11-4.3 REPAIR YAW PEDAL SUPPORT (AVIM) 11-4.3

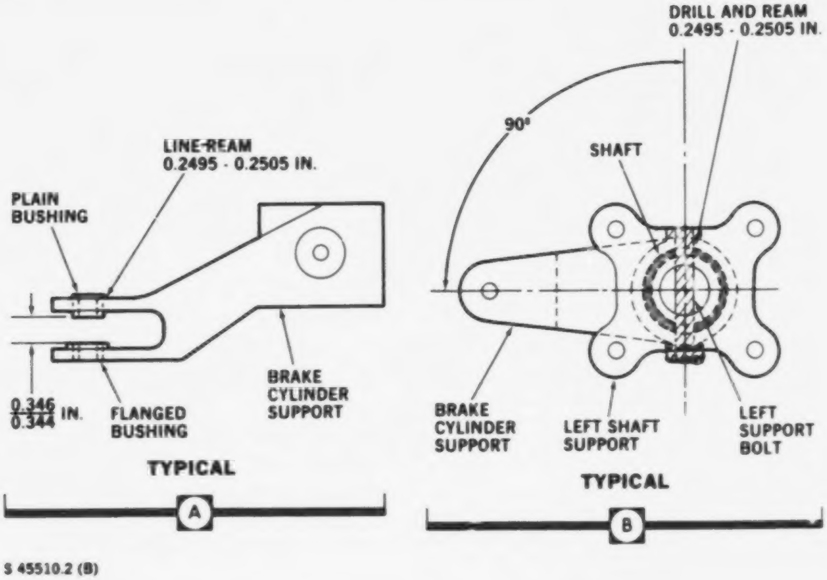

LINE-REAM
0.2495 - 0.2505 IN.
PLAIN
BUSHING
0.346/0.344 IN.
FLANGED
BUSHING
BRAKE
CYLINDER
SUPPORT
TYPICAL
A
DRILL AND REAM
0.2495 - 0.2505 IN.
90°
SHAFT
BRAKE
CYLINDER
SUPPORT
LEFT SHAFT
SUPPORT
LEFT
SUPPORT
BOLT
TYPICAL
B
S 45510.2 (B)

FIGURE 11-32 (SHEET 2 OF 2)

j. Check shaft for cracks in retaining ring grooves, and around boltholes. Replace shaft if necessary.

k. Check supports for cracks around bushing holes, boltholes, where arm attaches to hub, and check clevis ears. Replace support if necessary.

l. To replace bushings in support clevis, do this:

Coat flanged bushing with zinc chromate primer, Item 279, Appendix D. Using an arbor press, with bushing still wet with primer, press bushing into clevis ear. Flange to be on inside of clevis (Detail A).

m. Place a 0.344-0.346-inch size block on flange of flanged bushing before installing plain bushing.

(1) Coat plain bushing with zinc chromate primer, Item 279, Appendix D. While still wet with primer, press plain bushing in clevis ear against size block. Remove size block. It should be just a snug fit, not tight.

(2) Line-ream bushings to 0.2495- to 0.2505-inch diameter.

n. Clean support and shaft with degreasing solvent, Item 131, Appendix D.

11-4.3 REPAIR YAW PEDAL SUPPORT (AVIM) 11-4.3

o. Using masking tape, Item 228, Appendix D, mask bushings and bore of hub. Using epoxy primer, Item 150, Appendix D, and lacquer, Item 191, paint support.

p. Using masking tape, Item 228, Appendix D, mask bearing area between two snapring grooves at each end.

q. Using epoxy primer, Item 150, Appendix D, and lacquer, Item 191, paint shaft.

ASSEMBLE

r. If shaft is being replaced, install left side shaft support in shaft, line up hole in support with pilot hole in one end of shaft. Butt shaft against support.

s. Drill through support and shaft and ream hole 0.2495- to 0.2505-inch diameter.

t. Remove left support.

u. Install brake cylinder supports on shaft. Install retaining rings on two inside grooves.

v. Push supports against retaining rings. Position brake cylinder supports so arm of support is at right angle to left shaft support bolt hole (Detail B).

w. Aline boltholes in brake cylinder supports and drill and ream shaft to 0.2495- to 0.2505-inch diameter.

NOTE

Replacement brake cylinder supports and left shaft support have pilot holes. Use same procedure for replacing them.

x. Install left and right brake cylinder support on shaft with arms bending outward. Install bolts, washers, and nuts. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

y. On helicopters with support, 70400-01604-042, install retaining rings in grooves next to brake cylinder supports. Install washers against retaining rings.

z. Install left and right pedal supports on shafts with control rod attaching brackets outward. Install washers against pedal supports and install retaining ring in grooves.

aa. On helicopters with support, 70400-01604-044, do this:

(1) Install retaining rings in groove next to brake cylinder supports.

(2) If original shims are not available, temporarily install left and right pedal support and shaft supports. Measure gap between brake cylinder support and retaining ring.

(3) Split shims evenly on both sides of pedal support to obtain a gap of 0.000 - 0.010 inch.

(4) Remove pedal supports and shaft supports.

(5) Install shim(s) and left and right pedal supports on shaft.

(6) Install remaining shim(s) and retaining rings in grooves of shaft.

ab. Install left shaft support in shaft. Install thin concave washer on bolt with flat side toward head. Install bolt through shaft support and shaft. Install thick concave washer on bolt, curved side on shaft. Install nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ac. Install right shaft support in shaft. Tie to pedal support so it won't fall out.

11-4.4 REPLACE PEDAL ADJUSTER BEARINGS (AVIM) 11-4.4

INSPECT BEARINGS

a. Inspect bearings in small arm and links using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

b. Inspect bearing in long arm using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.025 INCH.**

REMOVE BEARINGS

c. Using an arbor press, a step type bearing remover, and correct size anvil, press bearings from arm or link.

INSPECT ARMS AND LINK

d. Fluorescent penetrant inspect arms and links for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.** Replace cracked parts.

e. Touch up paint arms and links as required (PARA 2-5).

INSTALL BEARINGS

f. Clean inside bore of arm or link with degreasing solvent, Item 131, Appendix D.

CAUTION

When cleaning replacement bearing outer race, make sure no degreasing solvent enters bearing.

g. Clean outside surface of replacement bearing with rag wet with degreasing solvent, Item 131, Appendix D.

h. Apply about a 1/16-inch bead of loctite, Grade B, Item 208, Appendix D, to leading edge of OD diameter and entrance edge of bearing bore. Bead shall be all around edge.

i. Within 10 minutes after applying loctite, press bearing in arm or link. Make sure bearing is fully seated and there is no loctite in bearing.

j. Allow 10 minutes for loctite to dry before handling arm or link.

k. Do rotational drag check of bearings as follows:

(1) Using suitable bolt and washers, install bolt through bearing with washers seated on lip of bearing. Tighten nut on bolt enough so that bearing rotates.

(2) Using a torque wrench and socket, turn bolthead and measure rotational drag of bearing.

(3) **MAXIMUM ROTATIONAL DRAG FOR BEARINGS IN ARMS IS 2 INCH-OUNCES.**

(4) **MAXIMUM ROTATIONAL DRAG FOR BEARINGS IN LINK IS 8 INCH-OUNCES.**

(5) Remove bolt, washers, and nut from bearings.

11-4.4 REPLACE PEDAL ADJUSTER BEARINGS (AVIM) 11-4.4

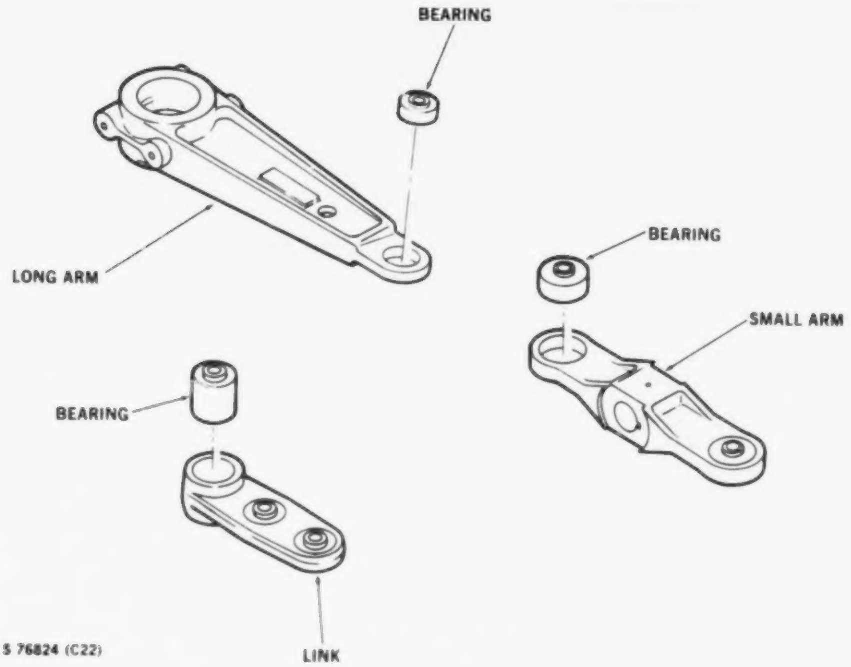

BEARING
LONG ARM
BEARING
SMALL ARM
BEARING
S 76824 (C22)
LINK

FIGURE 11-33

11-5 CYCLIC STICK, YOKE AND HOUSING - REPLACE 11-5

PARAGRAPH BREAKDOWN

11-5.1 REPLACE BOOT

11-5.2 REPLACE CYCLIC STICK

11-5.3 REPLACE CYCLIC STICK YOKE AND HOUSING

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Cotter Pin, MS24665-153
- Lockwire, Item 203, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Spring Scale, 0 - 20 lbs, AAA-S133

REFERENCES

- PARA 1-6.3
- PARA 11-1
- PARA 11-6
- TM 55-1520-237-T

11-5.1 REPLACE BOOT 11-5.1

a. Remove screws from floor access panel and boot retainer around cyclic stick.

b. Lift up and remove boot retainer over cyclic stick.

c. Unzip and remove boot.

d. Check area for cleanness and foreign material.

e. Install replacement boot over cyclic stick and around base of stick.

f. Install boot retainer over boot.

g. Install screws and washers.

h. Zipper boot around cyclic stick.

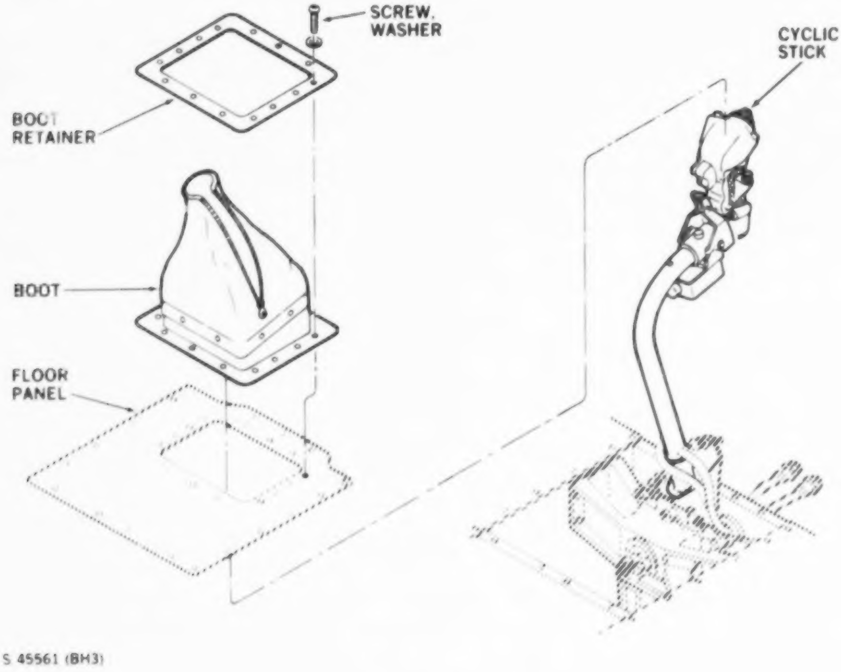

SCREW, WASHER
CYCLIC STICK
BOOT RETAINER
BOOT
FLOOR PANEL
S 45561 (BH3)

FIGURE 11-34

11-5.2 REPLACE CYCLIC STICK 11-5.2

REMOVE

NOTE

Remove and install steps are for pilot's and copilot's cyclic sticks.

a. Remove soundproofing panels covering flight control rods in cabin side walls or ceiling, as necessary.

b. Unbolt fore-and-aft control rod from bellcrank in midsection inside cabin. This will allow you to move cyclic stick without using hydraulic power.

c. Remove screws from floor access panel and boot retainer around cyclic stick.

d. Lift up and remove boot retainer.

e. Unzip and remove boot.

f. Remove floor access panel.

g. Turn off all electrical power.

h. Disconnect electrical connectors underneath pilot's/copilot's seat from cyclic stick wire bundle.

i. Remove attaching hardware and electrical cable clamp.

j. Working through yoke access hole, unbolt pushrod from cyclic stick.

k. Unbolt socket from yoke.

l. Remove cyclic stick. Guide wiring through beam as stick is removed.

m. Inspect and repair cyclic stick (PARA 11-6).

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

n. Guide wiring through beam and place cyclic stick into yoke, with curve in stick facing front of helicopter.

o. Install self-retaining bolt and washers (under head) (PARA 11-1).

p. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153.

q. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

r. Line up pushrod to socket.

s. Install self-retaining bolt and washers (under head) (PARA 11-1).

t. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

u. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

v. Connect electrical connectors to receptacle underneath cockpit floor pilot's/copilot's seat.

w. Install electrical cable clamp on beam with screw, washer, and nut.

11-5.2 REPLACE CYCLIC STICK 11-5.2

x. Push cyclic stick to front. **STICK GRIP MUST BE 0.730 - 0.790 INCH FROM INSTRUMENT PANEL.** Adjust front stopbolt, as necessary. **TIGHTEN JAMNUT 1/6 - 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.** Lockwire, Item 203, Appendix D, stopbolt.

y. Check area for cleanness and foreign material.

z. Line up front and rear control rod to bellcrank.

aa. Install self-retaining bolt and washers (under head) (PARA 11-1).

ab. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ac. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ad. Install boot, retainer, and floor access panel and install screws.

ae. Zipper boot around cyclic stick.

af. Do an operational check of applicable systems (TM 55-1520-237-T) to make sure original trouble that resulted in replacing unit has been corrected.

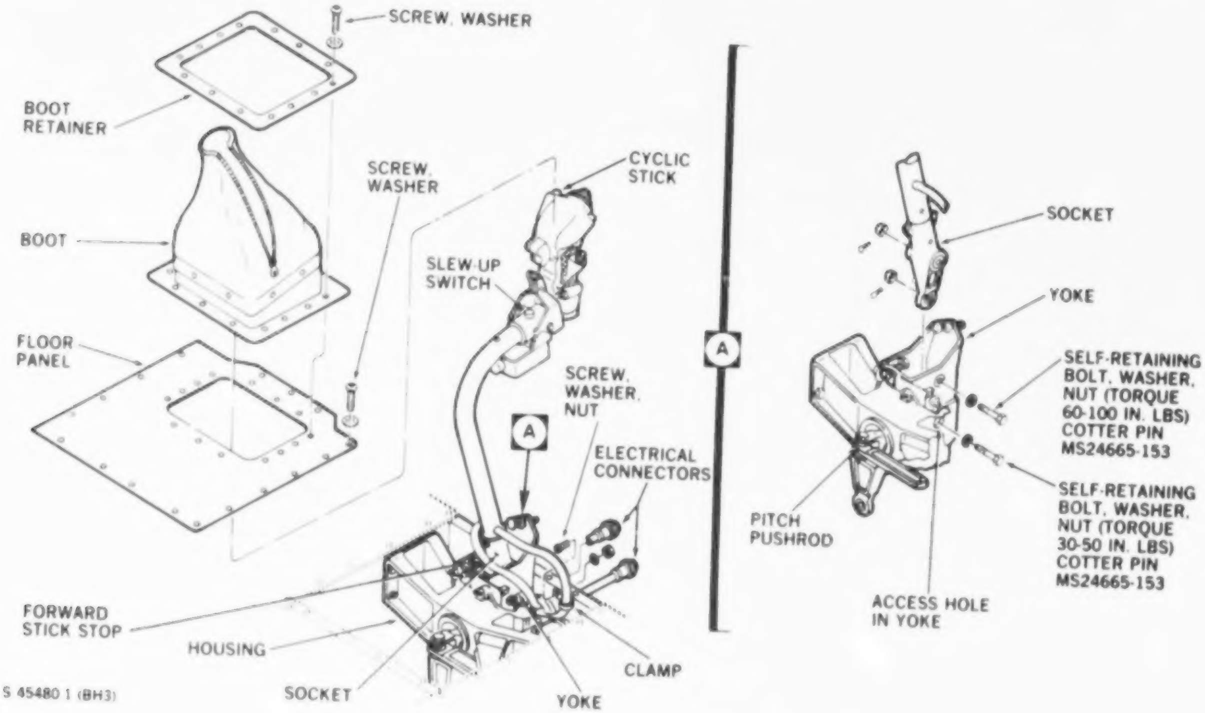
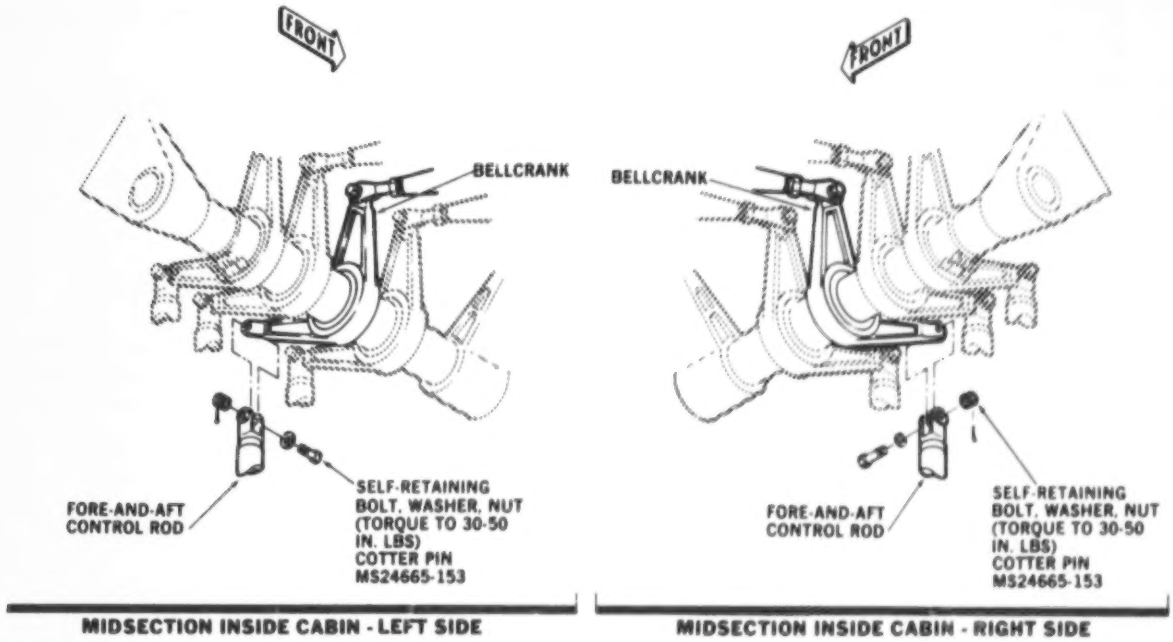

SCREW, WASHER
BOOT RETAINER
BOOT
FLOOR PANEL
SCREW, WASHER
CYCLIC STICK
SLEW-UP SWITCH
SCREW, WASHER, NUT
A
ELECTRICAL CONNECTORS
FORWARD STICK STOP
HOUSING
SOCKET
YOKE
CLAMP
S 45480 1 (BH3)
A
SOCKET
YOKE
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PITCH PUSHROD
ACCESS HOLE IN YOKE

FIGURE 11-35 (SHEET 1 OF 2)


FRONT
BELLCRANK
FORE-AND-AFT CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE TO 30-50 IN. LBS)
COTTER PIN MS24665-153
FRONT
BELLCRANK
FORE-AND-AFT CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE TO 30-50 IN. LBS)
COTTER PIN MS24665-153

MIDSECTION INSIDE CABIN - LEFT SIDE

MIDSECTION INSIDE CABIN - RIGHT SIDE

S 45480.2 (B)

FIGURE 11-35 (SHEET 2 OF 2)

11-5.3 REPLACE CYCLIC STICK YOKE AND HOUSING 11-5.3

REMOVE

a. Turn off all electrical power.

b. Remove screws from floor access panels and stick boot retainer.

c. Lift up and remove boot retainer.

d. Unzip and remove boot.

e. Remove floor access panels.

f. Unbolt cyclic stick at socket, and front and rear control rod. Remove cyclic stick from yoke (PARA 11-5.2).

g. On left side, unbolt and remove front and rear control rod from lever.

h. Unbolt lever from pitch control rod.

i. Unbolt and remove lever from yoke and housing support.

j. On right side, unbolt and remove bellcrank from link, pitch control rod, and yoke housing.

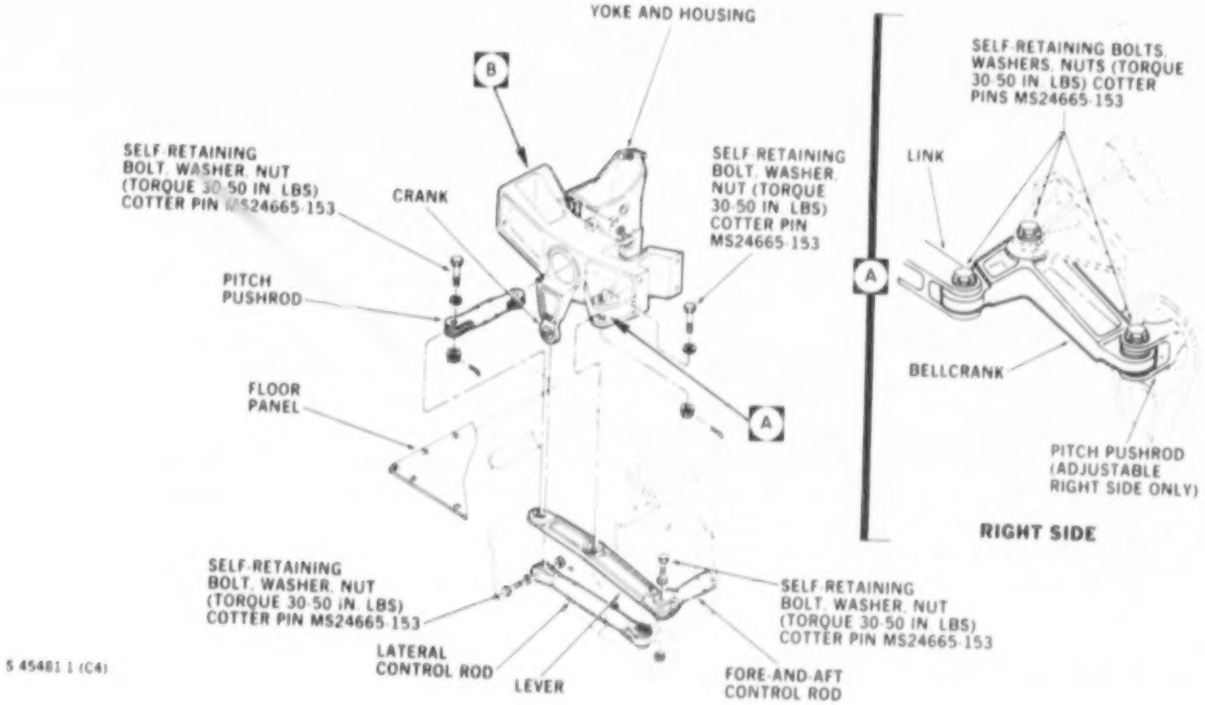

YOKE AND HOUSING
B
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CRANK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PITCH PUSHROD
FLOOR PANEL
A
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
LATERAL CONTROL ROD
LEVER
FORE-AND-AFT CONTROL ROD
5 45481 1 (C4)
A
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
LINK
BELLCRANK
PITCH PUSHROD (ADJUSTABLE RIGHT SIDE ONLY)
RIGHT SIDE

FIGURE 11-36 (SHEET 1 OF 3)

k. Unbolt and remove lateral control rod from yoke crank.

l. Unbolt and remove housing from airframe.

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

m. Place yoke and housing between walls of airframe. Install bolts and washers and bolts, washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS AND TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

NOTE

Bolts are different lengths. See Figure 11-36, Sheet 2, Detail B, for locations.

n. Push cyclic stick to front. **STICK GRIP MUST BE 0.730 - 0.790 INCH FROM INSTRUMENT PANEL.** Adjust front stopbolt, as necessary. **TIGHTEN JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.** Lockwire, Item 203, Appendix D, stopbolt.

o. Install lateral control rod to yoke crank.

p. Install self-retaining bolt and washers (under head) (PARA 11-1).

q. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

r. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

s. On left side, install lever in yoke housing support.

t. Install self-retaining bolt and washers (under head) (PARA 11-1).

u. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

v. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

w. Install pitch control rod in yoke and connect lever to rod.

x. Install self-retaining bolt and washers (under head) (PARA 11-1).

y. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

z. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aa. Install front and rear control rod on lever.

11-5.3 REPLACE CYCLIC STICK YOKE AND HOUSING 11-5.3

ab. Install self-retaining bolt and washers (under head) (PARA 11-1).

ac. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ad. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ae. On right side, install bellcrank in support.

af. Install self-retaining bolt and washers (under head) (PARA 11-1).

ag. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ah. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ai. Install adjustable pitch control rod in yoke with adjustable end inside. Connect bellcrank to rod.

aj. Install self-retaining bolt and washers (under head) (PARA 11-1).

ak. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

al. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

am. Connect link to bellcrank.

an. Install self-retaining bolt and washers (under head) (PARA 11-1).

ao. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ap. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aq. Install cyclic stick (PARA 11-5.2).

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	–
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

11-5.3 REPLACE CYCLIC STICK YOKE AND HOUSING 11-5.3

ADJUST

ar. Turn on all electrical power or run APU (PARA 1-6.2).

as. Turn on backup hydraulic system.

at. Pull cyclic stick fully back with 5-pound pull using spring scale, attached to grip area.

au. Loosen jamnut and adjust back secondary stop to a gap of 0.010 to 0.030 inch. **TIGHTEN JAMNUT FROM POINT WHERE A RISE IN TORQUE IS FELT.** Lockwire, Item 203, Appendix D, stopbolt.

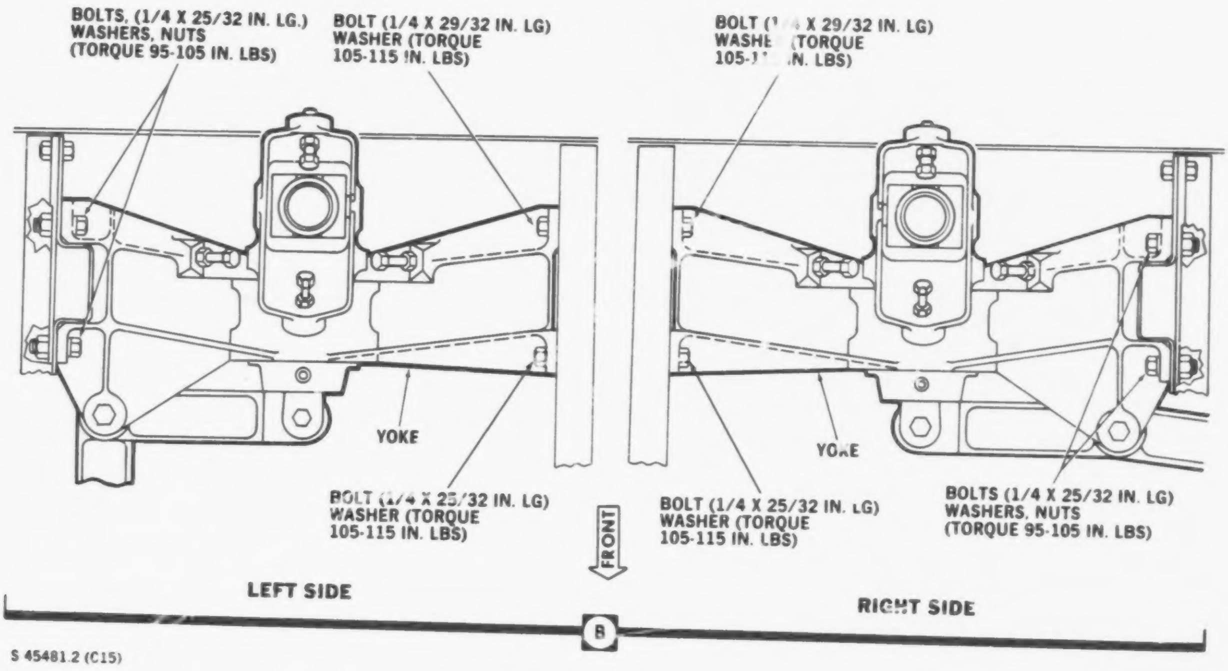

BOLTS, (1/4 X 25/32 IN. LG.)
WASHERS, NUTS
(TORQUE 95-105 IN. LBS)
BOLT (1/4 X 29/32 IN. LG)
WASHER (TORQUE
105-115 IN. LBS)
BOLT (1/4 X 29/32 IN. LG)
WASHER (TORQUE
105-115 IN. LBS)
YOKE
YOKE
BOLT (1/4 X 25/32 IN. LG)
WASHER (TORQUE
105-115 IN. LBS)
FRONT
BOLT (1/4 X 25/32 IN. LG)
WASHER (TORQUE
105-115 IN. LBS)
BOLTS (1/4 X 25/32 IN. LG)
WASHERS, NUTS
(TORQUE 95-105 IN. LBS)
LEFT SIDE
RIGHT SIDE
B
S 45481.2 (C15)

FIGURE 11-36 (SHEET 2 OF 3)

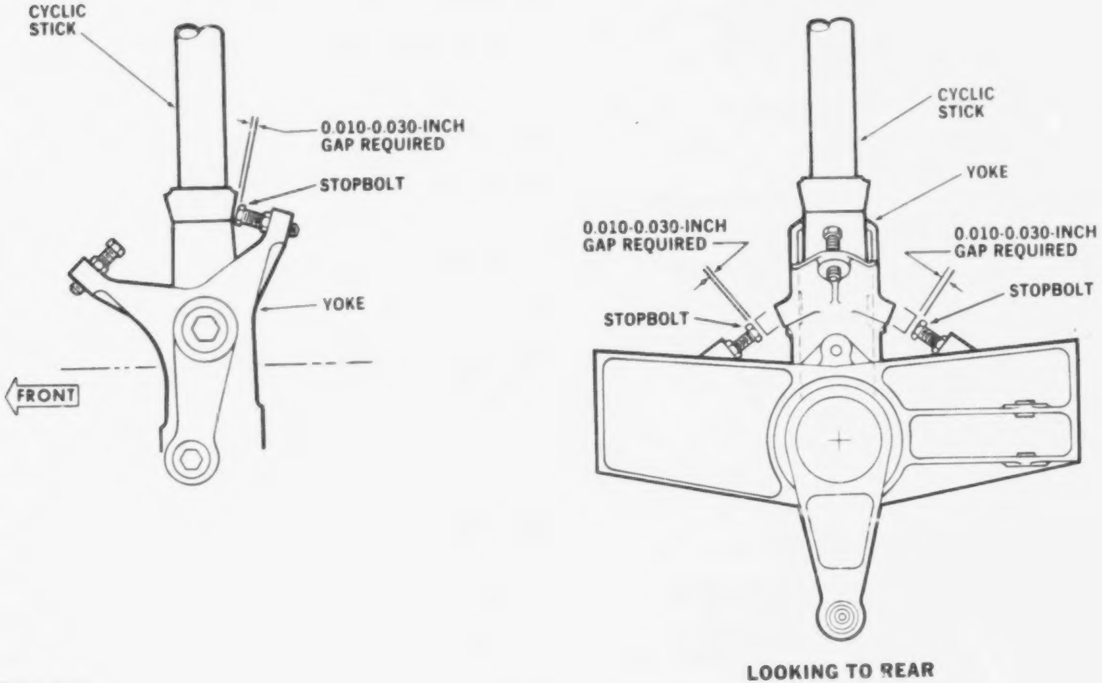
11-5.3 REPLACE CYCLIC STICK YOKE AND HOUSING 11-5.3

av. Adjust lateral stops in the same way.

aw. Turn off electrical and hydraulic power.

ax. Check area for cleanness and foreign material.

ay. Install boot, boot retainer, and floor access panels. Install screws.


CYCLIC STICK
0.010-0.030-INCH GAP REQUIRED
STOPBOLT
YOKE
FRONT
CYCLIC STICK
YOKE
0.010-0.030-INCH GAP REQUIRED
0.010-0.030-INCH GAP REQUIRED
STOPBOLT
STOPBOLT
LOOKING TO REAR

S 45481 3 (C15)

FIGURE 11-36 (SHEET 3 OF 3)

11-6 CYCLIC STICK - REPAIR (AVIM) 11-6

PARAGRAPH BREAKDOWN

11-6.1	REPLACE SOCKET (AVIM)
11-6.2	REPLACE BEARINGS (AVIM)
11-6.3	REPLACE TUBE (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68D - Aircraft Powertrain Repairer

MATERIALS/PARTS

- Alodine, Item 74, Appendix D
- Crocus Cloth, Item 128, Appendix D
- Degreasing Solvent, Item 131, Appendix D
- Loctite, Grade B, Item 208, Appendix D
- Primer, Item 277, Appendix D
- Surface Primer, Grade T, Item 333, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Arbor Press, OO-P-636
- Bolt, 1/4-inch diameter, 2-inch shank
- Dial Indicator, MIL-I-18422
- Powertrain Repairer's Toolkit, SC 5180-99-CL-A13
- Reamer Set, GGG-R-00180
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Twist Drill Set, GGG-D-751

REFERENCES

- PARA 2-5
- PARA 9-1
- TM 55-1500-322-24

11-6.1 REPLACE SOCKET (AVIM) 11-6.1

REMOVE

NOTE

Cyclic stick and socket are a matched assembly. Line-reaming may be necessary when assembling a used part with a new or unmatched used part. Identify cyclic sticks and sockets to assure reassembly with matched parts.

a. Unbolt and remove socket from stick.

INSPECT

b. Check socket assembly as follows:

(1) Inspect socket for nicks, gouges, cracks, and corrosion. Nicks and small gouges up to 0.020 inch deep by 1/16 inch wide by 1/2 inch long should be blended out with crocus cloth, Item 128, Appendix D. No cracks or corrosion is allowed. If damage is more than allowed, replace socket.

(2) Apply Alodine, Item 74, Appendix D, to reworked area. Touch up paint (PARA 2-5).

(3) Check bearing rotational drag (PARA 11-6.2).

(4) Inspect bearings for ratcheting, binding, and radial play (TM 55-1500-322-24). Check bearing radial play with a dial indicator. **MAXIMUM RADIAL PLAY IS 0.005 INCH.** Replace worn or damaged bearings (PARA 11-6.2).

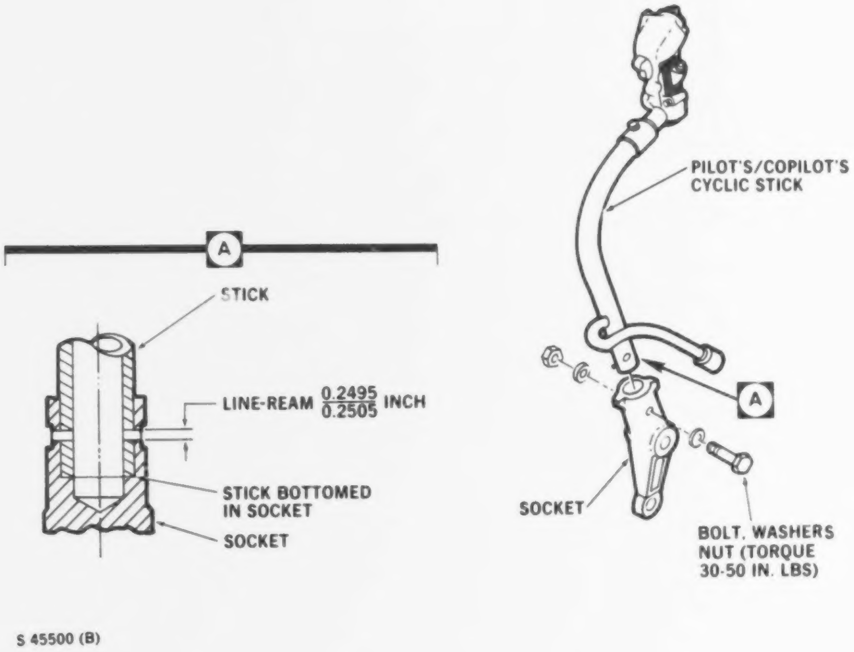

A
STICK
LINE-REAM $\frac{0.2495}{0.2505}$ INCH
STICK BOTTOMED IN SOCKET
SOCKET
PILOT'S/COPILOT'S CYCLIC STICK
A
SOCKET
BOLT, WASHERS NUT (TORQUE 30-50 IN. LBS)
S 45500 (B)

FIGURE 11-37

11-6.1 REPLACE SOCKET (AVIM) 11-6.1

c. Place socket on stick and line up boltholes.

d. Put bolt through socket and stick. If bolt fits, do not ream hole.

e. If required, line-ream hole 0.2495- to 0.2505-inch diameter. Remove socket and clean out metal chips.

f. Coat inside of socket hole with primer, Item 277, Appendix D.

g. Install socket on stick using bolt, washers, and nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS.**

11-6.2 REPLACE BEARINGS (AVIM) 11-6.2

REMOVE

a. Remove socket from stick (PARA 11-6.1).

b. Press bearings and spacer from socket using an arbor press and step-type bearing remover.

INSPECT

c. Inspect bearings using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARINGS, IS 0.005-INCH.**

INSTALL

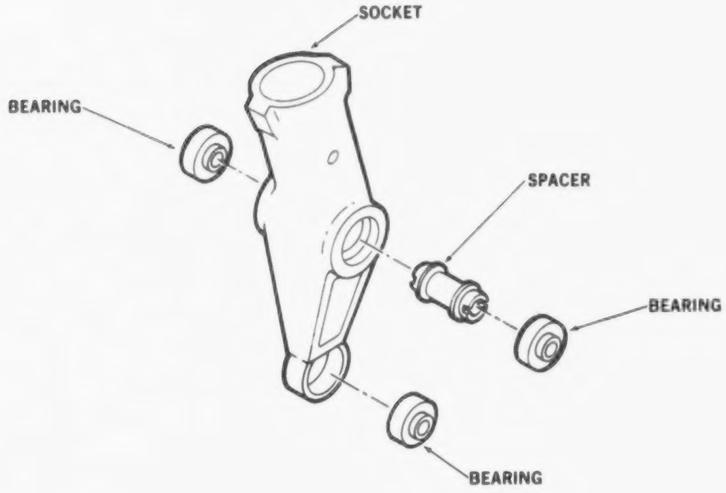
d. Clean inside diameter of socket with degreasing solvent, Item 131, Appendix D.

e. Install spacer in socket.

CAUTION

Do not get primer in bearings.

f. Apply a light coat of surface primer, Grade T, Item 333, Appendix D, to outside diameter of bearings and inside diameter of socket. Allow to air-dry for at least 30 seconds.



S 45501 (B)

FIGURE 11-38

11-6.2 REPLACE BEARINGS (AVIM) 11-6.2

CAUTION

To keep from damaging bearing, do not get solvent, surface primer, or loctite in bearing.

g. Apply about a 1/16-inch bead of loctite, Grade B, Item 208, Appendix D, to leading edge of bearing outside diameter and leading edge of socket bore. Bead should be all around edges.

h. Within 10 minutes after applying surface primer, press bearings in socket.

i. Wipe extra surface primer from bearings with cloth dampened with degreasing solvent, Item 131, Appendix D.

NOTE

Surface primer exposed to air will not dry.

j. Do a rotational drag check of bearings as follows:

(1) Install 1/4-inch diameter bolt through bearings and secure with nut.

(2) Using torque wrench, and socket, turn bolt head and measure rotational drag of bearings.

(3) If drag is greater than 20 inch-ounces, replace bearings.

(4) Remove bolt from bearings.

11-6.3 REPLACE TUBE (AVIM) 11-6.3

REMOVE

NOTE

Cyclic stick and socket are a matched assembly. Line-reaming may be necessary when assembling a used part with a new or unmatched used part. Identify cyclic sticks and sockets to assure reassembly with matched parts.

a. Unbolt and remove socket from tube.

b. Remove grip and wiring from stick (PARA 9-1).

INSTALL

c. Place socket on stick and line up boltholes.

d. Put bolt through socket and stick. If bolt fits, do not ream hole.

e. If required, line-ream holes 0.2495- to 0.2505-inch diameter.

f. Remove socket from stick and clean out metal chips.

g. Install grip and wiring in replacement tube (PARA 9-1).

h. Coat inside of socket hole with primer, Item 277, Appendix D.

i. Install socket on tube using bolt, washers, and nut. **TORQUE NUT 30 - 50 INCH-POUNDS.**

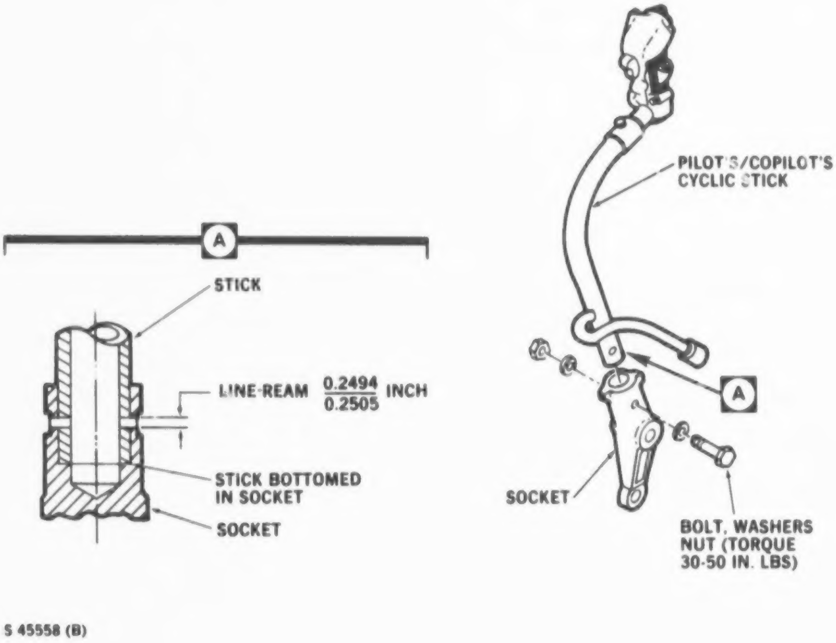

PILOT'S/COPILOT'S CYCLIC STICK
A
STICK
LINE-REAM 0.2494/0.2505 INCH
STICK BOTTOMED IN SOCKET
SOCKET
A
SOCKET
BOLT, WASHERS NUT (TORQUE 30-50 IN. LBS)
S 45558 (B)

FIGURE 11-39

11-7 COLLECTIVE STICK 11-7

PARAGRAPH BREAKDOWN

11-7.1	REPLACE BOOT AND COVER
11-7.2	REPLACE PILOT'S COLLECTIVE STICK
11-7.3	REPLACE COPILOT'S COLLECTIVE STICK
11-7.4	PREPLACE COLLET BLOCKS
11-7.5	REPLACE PILOT'S COLLECTIVE STICK SUPPORT
11-7.6	REPLACE COPILOT'S COLLECTIVE STICK SUPPORT

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 7, Appendix D
- Adhesive, Item 31, Appendix D
- Adhesive, Item 62, Appendix D
- Cheesecloth, Item 98, Appendix D
- Cloth, Item 110, Appendix D
- Cotter Pin, MS24665-153
- Lockwire, Item 203, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Scouring Pad, Item 299, Appendix D
- Silicone Fluid, Item 321, Appendix D
- Velcro Tape Hook, Item 382, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Spring Scale, 0 - 50 pounds, AAA-S133

REFERENCES

- PARA 1-6.3
- PARA 11-1
- PARA 11-2
- PARA 11-8
- TM 55-1520-237-T

11-7.1 REPLACE BOOT AND COVER 11-7.1

PILOT

a. Remove top panel from around collective stick, and lower panel halves.

b. Remove screws and remove cover from side of center console.

c. Remove top and bottom panel halves.

d. Check area to be sure it is free of foreign material.

e. Install replacement top and bottom panel halves on cover. Secure cover to center console with screws. Join panels.

f. Install top panel around collective stick and panels.

COPILOT

g. Remove top panel from collective stick and center panel.

h. Remove center panel from bottom panel.

i. Remove screws and remove cover from floor and rear bulkhead.

j. Remove screws and remove retainer and bottom panel from cover.

k. On helicopters 81-23547 and subsequent, remove side panel from top of cover assembly and bulkhead by pulling Velcro straps.

l. Pull Velcro strap on seam of side cover and lift side cover forward away from bulkhead and electrical cable.

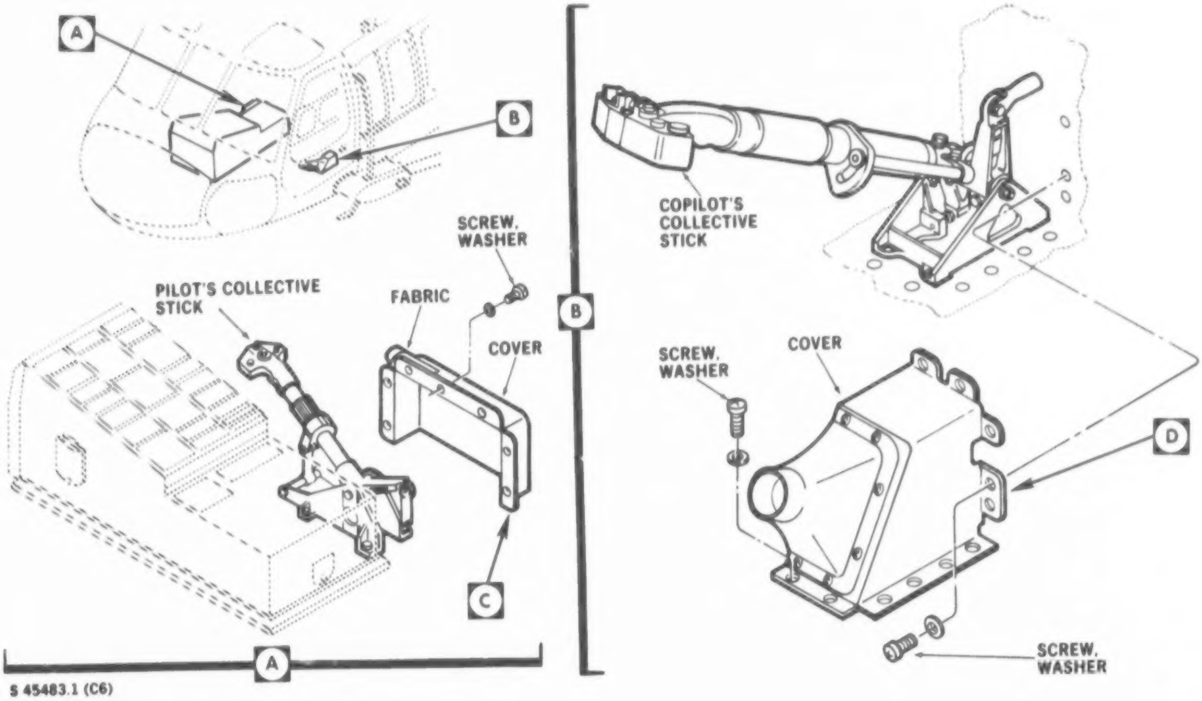

A
B
SCREW, WASHER
PILOT'S COLLECTIVE STICK
FABRIC
COVER
C
A
S 45483.1 (C6)
B
COPILOT'S COLLECTIVE STICK
SCREW, WASHER
COVER
D
SCREW, WASHER

FIGURE 11-40 (SHEET 1 OF 2)

11-7.1 REPLACE BOOT AND COVER 11-7.1

m. Check area to be sure it is free of foreign material.

n. Put replacement bottom panel on cover and install retainer on cover with screws and washers.

o. Secure cover to floor and rear bulkhead with screws.

p. Install center panel on bottom panel and close at seam.

q. Install top panel around collective stick and around center panel.

r. On helicopters 81-23547 and subsequent, place hole in side cover over electrical cable and fasten Velcro strap.

s. Fasten top of side cover to cover assembly by fastening Velcro strip.

t. Fasten end of side cover to airframe by fastening Velcro strip.

u. Remove damaged Velcro tape hook from structure, using a wooden or plastic scraper.

WARNING

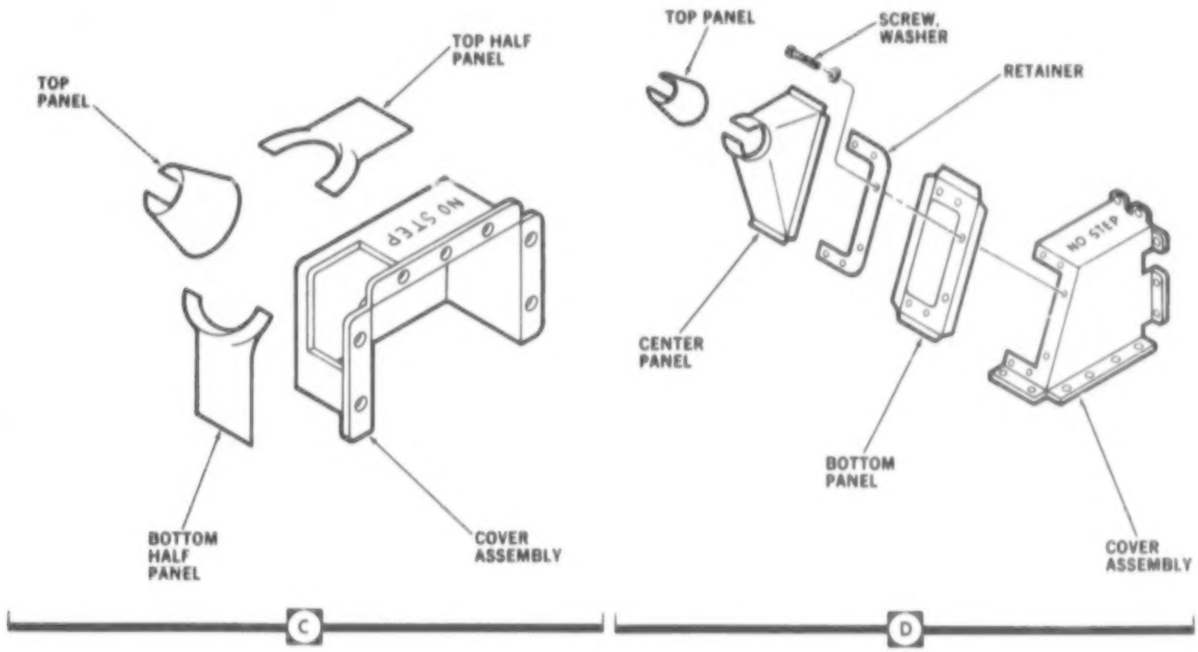
- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

v. Using a clean cloth dampened in methyl ethyl ketone, Item 233, Appendix D, and a nonmetallic scraper, remove remaining adhesive from structure.

w. Within 15 minutes after cleaning, apply coat of adhesive, Item 62, Appendix D, to tape hook and structure. Allow adhesive to dry for 10 minutes or until tacky.

x. Press Velcro tape hook onto adhesive on structure. Make sure of good bond between Velcro tape hook and structure. Allow adhesive to dry at room temperature for 12-16 hours.

11-7.1 REPLACE BOOT AND COVER 11-7.1


TOP PANEL
TOP HALF PANEL
NO STEP
BOTTOM HALF PANEL
COVER ASSEMBLY
C
TOP PANEL
SCREW, WASHER
RETAINER
NO STEP
CENTER PANEL
BOTTOM PANEL
COVER ASSEMBLY
D

S 45483.2 (C6)

FIGURE 11-40 (SHEET 2 OF 2)

11-7.2 REPLACE PILOT'S COLLECTIVE STICK 11-7.2

REMOVE

a. Turn off all electrical power.

b. Remove cover and boot (PARA 11-6.1).

c. Disconnect electrical connector at base of pilot's collective stick.

d. Unbolt control rod at collective stick socket.

e. Tilt pilot's seat back.

f. Unbolt and remove drag strut from support. Remove bushing, washer, and shim.

g. Unbolt collective control stick where socket is held to support.

h. Slide collective stick and socket assembly out of support.

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

i. Place collective stick and socket between support arms.

j. Install self-retaining bolt and washers (under head) (PARA 11-1).

k. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153.

l. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

NOTE

Bolthead to face outboard.

m. Install long bushing in drag strut on pilot's collective stick.

n. Install shim; then washer, over plain bushing in support (Figure 11-41, Detail A).

o. Fasten drag strut to pilot's collective stick support with bolt, washer, and nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS. CHECK FOR 0.003- TO 0.008-INCH ENDPLAY.** Install cotter pin, MS24665-153.

p. Bolt control rod to collective stick socket assembly.

q. Install self-retaining bolt and washers (under head) (PARA 11-1).

r. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

s. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

t. Move pilot's seat upright.

u. Connect electrical connector to receptacle at base of stick.

v. On pilot's collective stick, check friction grip for proper adjustment (PARA 11-7.4).

11-7.2 REPLACE PILOT'S COLLECTIVE STICK 11-7.2

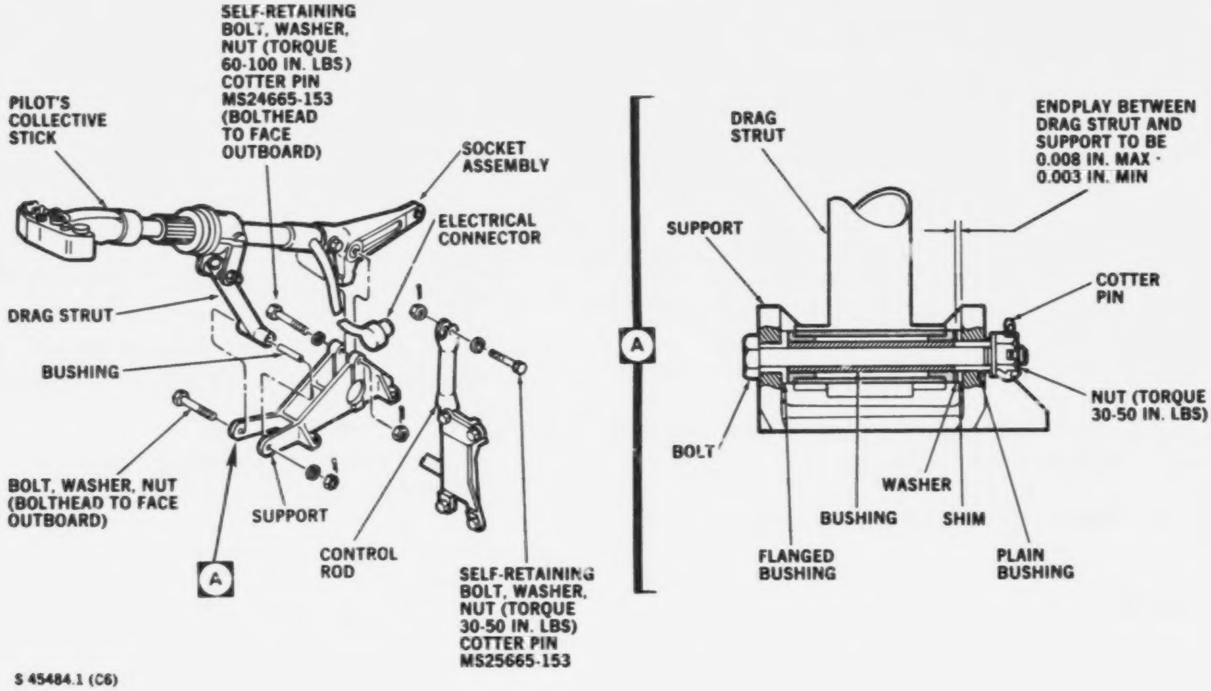

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-153 (BOLTHEAD TO FACE OUTBOARD)
PILOT'S COLLECTIVE STICK
SOCKET ASSEMBLY
ELECTRICAL CONNECTOR
DRAG STRUT
BUSHING
BOLT, WASHER, NUT (BOLTHEAD TO FACE OUTBOARD)
SUPPORT
CONTROL ROD
A
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS25665-153
S 45484.1 (C6)
A
DRAG STRUT
ENDPLAY BETWEEN DRAG STRUT AND SUPPORT TO BE 0.008 IN. MAX - 0.003 IN. MIN
SUPPORT
COTTER PIN
NUT (TORQUE 30-50 IN. LBS)
BOLT
WASHER
BUSHING
SHIM
FLANGED BUSHING
PLAIN BUSHING

FIGURE 11-41

w. Install cover and boot (PARA 11-7.1).

x. Do an operational check of all switches (TM 55-1520-237-T).

best copy available

11-7.3 REPLACE COPILOT'S COLLECTIVE STICK 11-7.3

REMOVE

a. Turn off all electrical power.

b. Remove cover and boot (PARA 11-7.1).

c. Disconnect electrical connector at base of copilot's collective stick.

d. Remove clamp and spacer from airframe.

e. Remove clamp from electrical cable.

f. Unbolt control rod at collective stick socket.

g. Unbolt collective control stick where socket is held to support.

h. Slide collective stick and socket assembly out of support.

INSTALL

i. Turn off all electrical power.

j. Place collective stick and socket between support arms.

k. Install self-retaining bolt and washers (under head) (PARA 11-1).

l. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153.

m. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

n. Bolt control rod to collective stick socket assembly.

o. Install self-retaining bolt and washers (under head) (PARA 11-1).

p. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

q. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

r. Connect electrical connector to receptacle at base of stick.

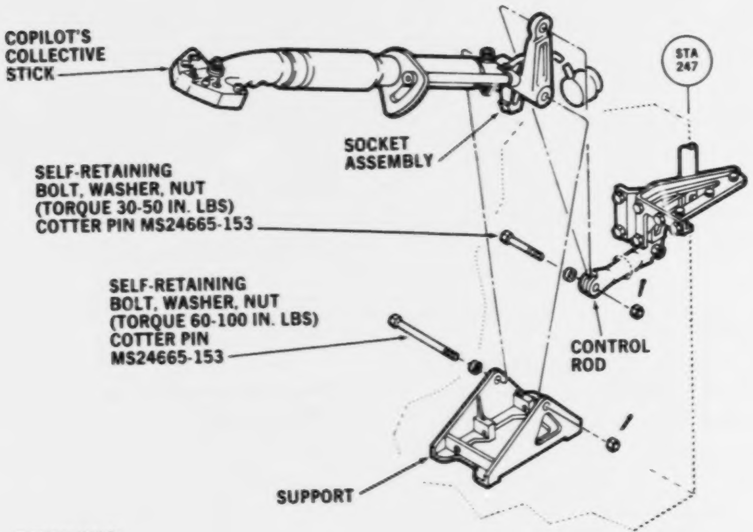
s. Place clamp on electrical connector.

t. Install clamp on airframe using screw, spacer, washer, and nut.

u. Install cover and boot (PARA 11-7.1).

v. Do an operational check of all switches (TM 55-1520-237-T).

11-7.3 REPLACE COPILOT'S COLLECTIVE STICK 11-7.3


COPILOT'S COLLECTIVE STICK
STA 247
SOCKET ASSEMBLY
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
SUPPORT

S 45484.2 (C6)

FIGURE 11-42

11-7.4 REPLACE COLLET BLOCKS

REMOVE

a. Remove bolt, washer, and adjustable stop from friction grip.

b. Unscrew friction grip from sleeve.

c. Remove special bolts, washers, and spacer(s) from stop and guard, sleeve, and collet blocks.

d. Using a thin nonmetallic drift, carefully tap collet blocks and seal from sleeve.

INSTALL

e. Make sure collets are clean and free of any dirt, nicks, scratches, corrosion, or other damage that could stop them from sliding smoothly on stick.

f. Check collective stick for dirt, nicks, scratches, corrosion, or other damage that could stop friction lock and sleeve from sliding smoothly on stick.

g. Replace any damaged parts (PARA 11-8).

h. Be sure stick, friction grip, and sleeve are clean and dry.

i. Place replacement collet halves on collective stick, and on seal, being careful not to damage seal as it is seated in groove inside collet.

CAUTION

When applying a light coat of silicone fluid to OD of collet halves, make sure no fluid gets between collective stick and ID of collet halves.

j. Apply a light coat of silicone fluid, Item 321, Appendix D, to OD of collet halves at tapered ends of collets.

k. Slide collet halves into sleeve.

l. Line up boltholes in collet halves, stop and guard, and sleeve, and install special bolts, washers, and spacer(s). Make sure collet halves are secure.

m. Thread friction grip into sleeve.

n. Install adjustable stop on sleeve with bolt and washer.

o. Connect external electrical power or run APU (PARA 1-6.3).

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	-
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

11-7.4 REPLACE COLLET BLOCKS 11-7.4

p. On upper console, place BACKUP HYD PUMP switch ON.

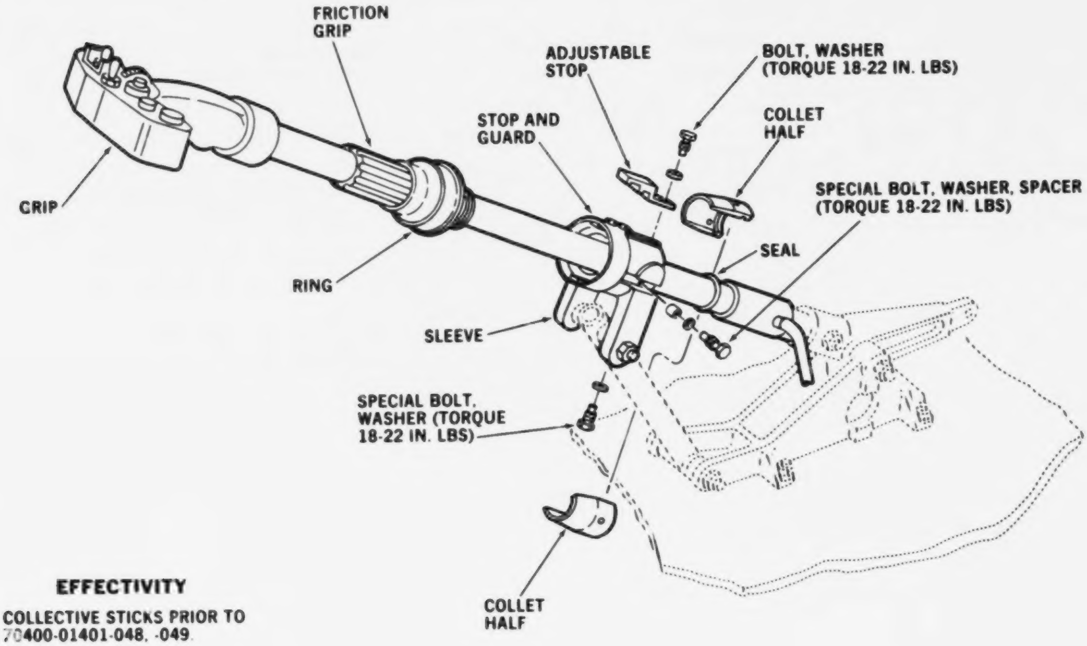
WARNING

The friction grip must be adjusted so pilot can move collective stick with friction lock full on.

NOTE

On collective sticks prior to 70400-01401-048, friction locks operate as follows:

(1) As friction grip threads into sleeve it squeezes collet on collective stick.


FRICTION GRIP
ADJUSTABLE STOP
BOLT, WASHER (TORQUE 18-22 IN. LBS)
COLLET HALF
STOP AND GUARD
SPECIAL BOLT, WASHER, SPACER (TORQUE 18-22 IN. LBS)
GRIP
SEAL
RING
SLEEVE
SPECIAL BOLT, WASHER (TORQUE 18-22 IN. LBS)
COLLET HALF

EFFECTIVITY
COLLECTIVE STICKS PRIOR TO 70400-01401-048, -049

S 45485 (C18)

FIGURE 11-43

(2) Amount of squeeze is set when lug on friction grip contacts stop and guard.

(3) If stop and guard is moved toward grip, lug will contact stop in less turns, squeeze is less.

(4) If stop and guard is moved away from grip, lug will contact stop in more turns, squeeze is more.

(5) Adjustable stop (or bonded stop) is set, so when ring touches stop, friction on stick is fully released. It prevents grip from coming out of sleeve completely and allows pilot to apply friction in only a few turns.

q. High or fading friction forces may be eliminated by lightly scuffing ID of collet blocks using abrasive cloth, Item 7, Appendix D, or equivalent.

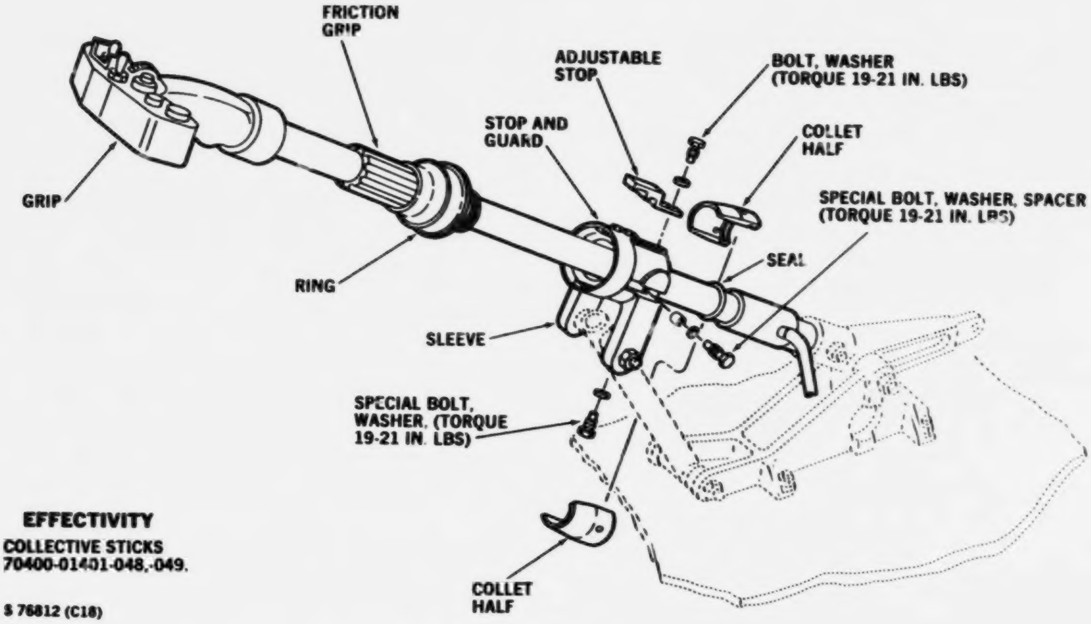

FRICTION GRIP
ADJUSTABLE STOP
BOLT, WASHER (TORQUE 19-21 IN. LBS)
STOP AND GUARD
COLLET HALF
SPECIAL BOLT, WASHER, SPACER (TORQUE 19-21 IN. LBS)
GRIP
SEAL
RING
SLEEVE
SPECIAL BOLT, WASHER, (TORQUE 19-21 IN. LBS)
EFFECTIVITY
COLLECTIVE STICKS 70400-01401-048,-049.
S 76812 (C18)
COLLET HALF

FIGURE 11-44

11-7.4 REPLACE COLLET BLOCKS 11-7.4

r. Adjust friction grip as follows:

(1) With lock full on, use a spring scale, at stick grip just behind lighted panel and move pilot's collective stick up and down.

(2) **STICK MUST MOVE WITH 20 - 40 POUNDS PULL.**

(3) If pull is above or below limit, back off friction grip, loosen special bolts, slide stop and guard in slots in sleeve, forward to loosen, back to tighten. Check force required to move stick.

(4) If more adjustment is needed to loosen friction, turn stop and guard in same direction as loosening friction grip, and install in next set of slots in sleeve.

(5) To tighten friction, turn stop and guard in same direction as tightening friction grip, and install in sleeve.

(6) Adjust stop and guard so friction grip may be backed off without having lug on friction grip strike stop and guard, after backing off one full turn.

s. Set adjustable stop so friction grip may be backed off from locked position 2-1/2 to 3 full turns, before ring touches stop.

(1) Tighten stop and guard attaching bolt. **TORQUE BOLT TO 18 - 22 INCH-POUNDS.**

(2) Lockwire, Item 199, Appendix D, stop and guard attaching bolt.

(3) Tighten special bolts. **TORQUE TO 18 - 22 INCH-POUNDS.**

t. Move collective stick full up and full down and check for binds and smoothness of operation.

u. Place BACKUP HYD PUMP switch OFF. Remove external electrical power or shut down APU.

NOTE

On collective sticks, 70400-01401-048, -049, friction lock operates as follows:

(1) As friction grip threads into sleeve it squeezes collet halves on collective stick.

(2) Amount of squeeze is set when stop segment on friction grip contacts stop and guard.

(3) If friction grip is turned toward stop and guard, friction is increased.

11-7.4 REPLACE COLLET BLOCKS 11-7.4

(4) If friction grip is turned away from stop and guard, friction is decreased.

(5) Adjustable stop is set so when ring touches stop, friction on stick is fully released. It prevents friction grip from coming fully out of sleeve and allows pilot to apply friction in only a few turns.

v. Adjust friction grip as follows:

(1) Connect external electrical power or start APU (PARA 1-6.3).

(2) With lock full on, use spring scale attached to friction grip, move pilot's collective stick up and down. **STICK MUST MOVE WITH 20 - 40 POUNDS PULL.**

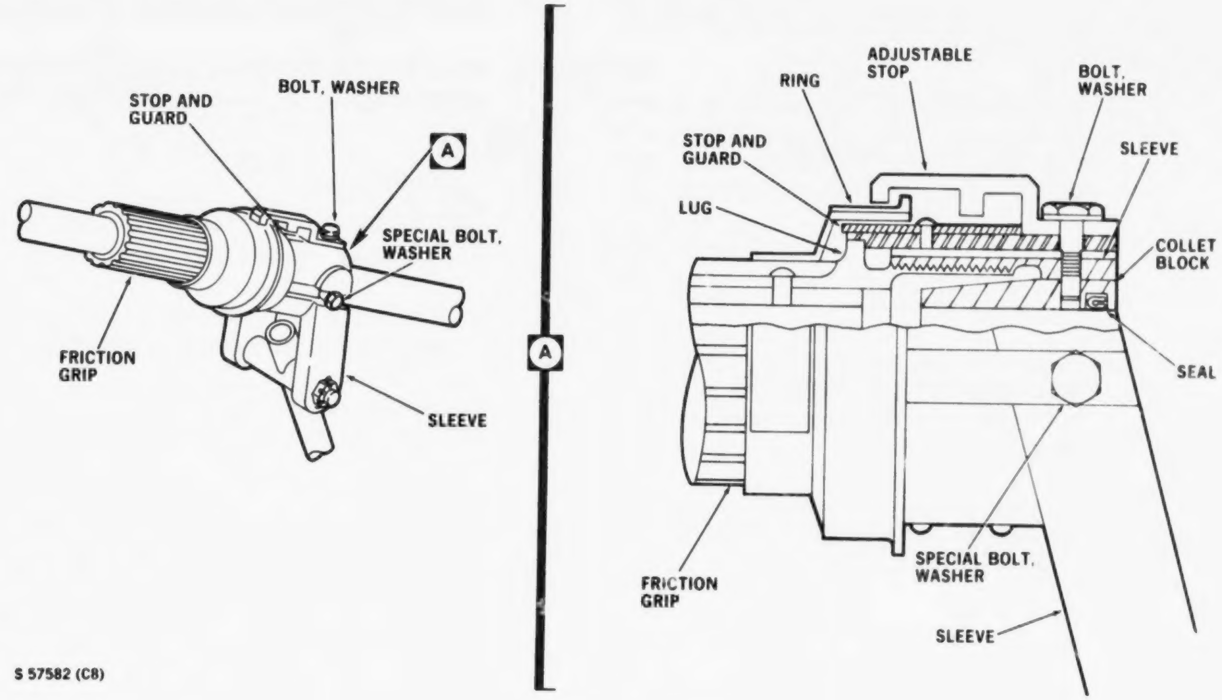

STOP AND GUARD
BOLT, WASHER
A
SPECIAL BOLT, WASHER
FRICTION GRIP
SLEEVE
A
ADJUSTABLE STOP
RING
BOLT, WASHER
STOP AND GUARD
SLEEVE
LUG
COLLET BLOCK
SEAL
FRICTION GRIP
SPECIAL BOLT, WASHER
SLEEVE
S 57582 (C8)

FIGURE 11-45

11-7.4 REPLACE COLLET BLOCKS 11-7.4

(3) On upper console, place BACKUP HYD PUMP switch OFF.

w. If pull is above or below limits, do this:

(1) Make a pencil mark on outside of ring on friction grip to show position of tang on inside of friction grip.

(2) On upper console, place BACKUP HYD PUMP switch ON.

(3) Using spring scale attached to friction grip, turn friction grip until desired friction is obtained (20 - 40 pounds pull).

(4) On upper console, place BACKUP HYD PUMP switch OFF.

(5) Note distance between marked position of tang and nearest edge of first slot in sleeve that was passed. This distance will determine hole in stop segment that will be used when installing stop segment.

(6) Unscrew friction grip from sleeve and install stop of stop and guard in slot of sleeve noted in previous step.

(7) Install stop segment on friction grip with edge of stop segment as close as possible to stop of stop and guard, using self-locking screw.

NOTE

Do not reuse self-locking screw if friction must be readjusted.

(8) Slide stop and guard to front of collective stick, to make positive contact between stop and stop segment. Check that stop and guard has not slid far enough to prevent friction grip to be backed off at least one turn. If one turn cannot be obtained, use a nonmetallic drift and tap stop and guard back until grip can be turned one full turn.

(9) On upper console, place BACKUP HYD PUMP switch ON.

(10) Check to be sure friction grip is in positive stop.

(11) Use spring scale, attached to friction grip, check for 20 - 40 pounds pull to move collective stick.

(12) If desired friction was not obtained, unscrew friction grip far enough to get to stop segment. Remove self-locking screw from stop segment and adjust stop segment as needed. Install new self-locking screw in stop segment.

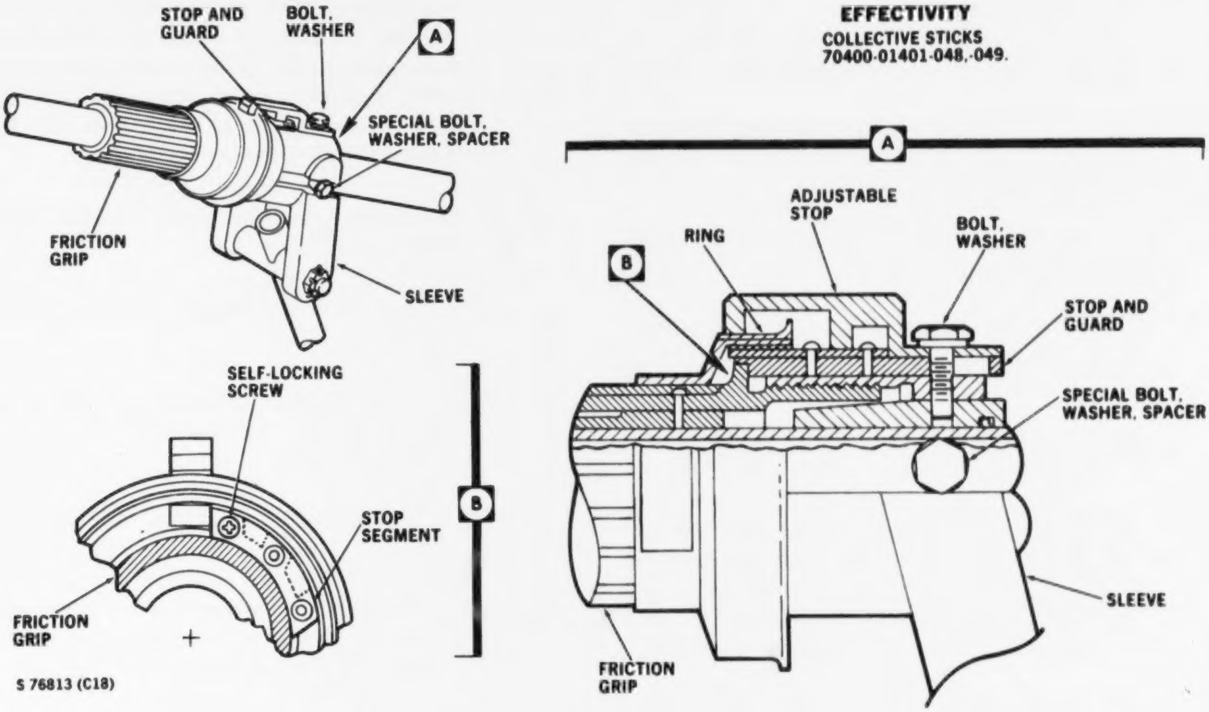
NOTE

Do not reuse self-locking screw.

(13) Reinstall friction grip in sleeve and recheck force to move collective stick.

(14) If correct friction cannot be obtained after adjusting stop segment, remove friction grip from sleeve and reposition stop of stop and guard in next slot of sleeve past pencil mark. Repeat adjustment procedure until correct friction is obtained or replace collet halves.

11-7.4 REPLACE COLLET BLOCKS 11-7.4


STOP AND GUARD
BOLT, WASHER
A
SPECIAL BOLT, WASHER, SPACER
FRICTION GRIP
SLEEVE
SELF-LOCKING SCREW
STOP SEGMENT
FRICTION GRIP
B
A
ADJUSTABLE STOP
RING
BOLT, WASHER
B
STOP AND GUARD
SPECIAL BOLT, WASHER, SPACER
SLEEVE
FRICTION GRIP
S 76813 (C18)

EFFECTIVITY
COLLECTIVE STICKS
70400-01401-048,-049.

FIGURE 11-46

(15) On upper console, place BACKUP HYD PUMP switch OFF.

(16) Set adjustable stop so friction grip can be backed off from locked position 2-1/2 to 3 full turns before ring touches stop.

(17) Install bolt and washer in adjustable stop. **TORQUE BOLT TO 19 - 21 INCH-POUNDS.**

(18) Install special bolt and washer in stop of stop and guard. Install special bolts, washers, and spacers in sleeve and collet halves. **TORQUE BOLTS TO 19 - 21 INCH-POUNDS.** Lockwire, Item 203, Appendix D, bolts in pairs.

x. Disconnect external electrical power or shut down APU (PARA 1-6.3).

11-7.5 REPLACE PILOT'S COLLECTIVE STICK SUPPORT 11-7.5

REMOVE

a. Turn off all electrical power.

b. Remove cover and boot (PARA 11-7.1).

c. Remove pilot's collective stick (PARA 11-7.2).

d. Unbolt and remove pilot's collective stick support from cabin floor.

NOTE

Shim washers are bonded to floor under stick support. Insure shims are kept in same position on installation.

e. Check stick support for loose shim material. Peel from support and replace shim stock on stack it came from.

f. Loosely install bolts in stick support bolt holes to protect shims.

INSTALL

g. Turn off all electrical power.

h. Check mounting pad bolt holes for damaged or missing shim washers. Replace missing washers as follows:

(1) Remove shim and adhesive debris with a nonmetallic scraper and scouring pad, Item 299, Appendix D.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Wipe washer and floor bonding contact surfaces clean with methyl ethyl ketone, Item 233, Appendix D and clean cheesecloth, Item 98, Appendix D. Wipe until no stain shows on cloth after last wipe. Do not touch treated surfaces.

11-7.5 REPLACE PILOT'S COLLECTIVE STICK SUPPORT 11-7.5

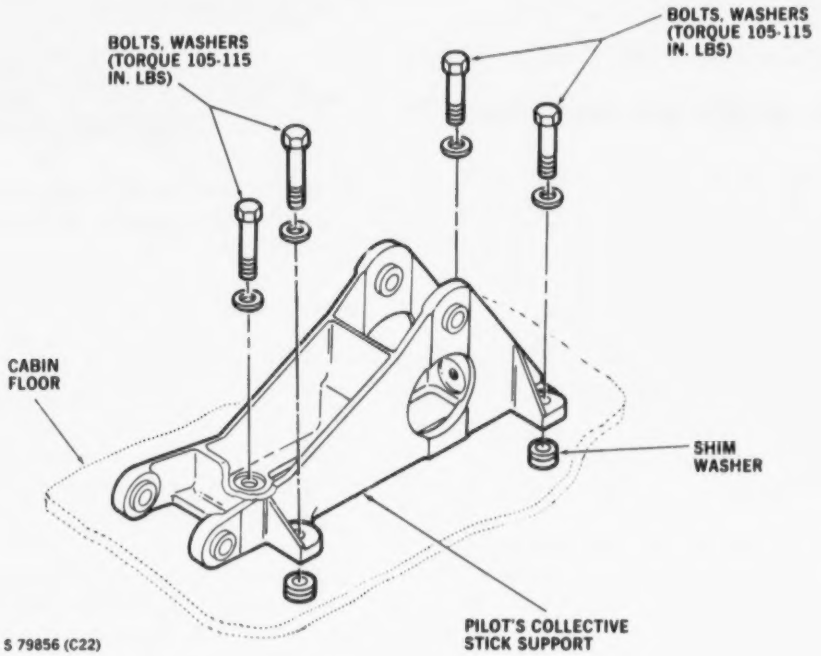

BOLTS, WASHERS (TORQUE 105-115 IN. LBS)
BOLTS, WASHERS (TORQUE 105-115 IN. LBS)
CABIN FLOOR
SHIM WASHER
PILOT'S COLLECTIVE STICK SUPPORT
S 79856 (C22)

FIGURE 11-47

(3) Apply adhesive, Item 31, Appendix D to shim washer and floor contact areas. Do not get adhesive in bolt holes.

(4) Using bolt as a guide to center washer over bolt hole, press shim washer onto floor.

(5) Loosely install pivot bolt through collective stick support pivot bushings.

i. Install pilot's collective stick support on cabin floor with washers and bolts. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

j. Turn stick pivot bolt with fingers. **NO BINDING ALLOWED.** A stuck or binding bolt shows that stick support is twisted due to one or more of the mount pads being higher than the rest. Unbolt support and peel shims as required until pivot bolt turns free with mounting bolts torqued to 105 -115 inch pounds.

k. Install pilot's collective stick (PARA 11-7.2).

l. Install cover and boot (PARA 11-7.1).

m. Do a rig check of main rotor (PARA 11-2).

n. Do an operational check of all switches (TM 55-1520-237-T).

11-7.6 REPLACE COPILOT'S COLLECTIVE STICK SUPPORT 11-7.6

REMOVE

a. Turn off all electrical power.

b. Remove cover and boot (PARA 11-7.1).

c. Remove copilot's collective stick (PARA 11-7.3).

d. Unbolt and remove copilot's collective stick support from floor.

NOTE

Shim washers are bonded to floor under stick support. Insure shims are kept in same position on installation.

e. Check stick support for loose shim material. Peel shim stock from support. Replace material on shim stack it came from.

f. Loosely install bolts in support bolt holes to protect shims.

INSTALL

g. Turn off all electrical power.

h. Check mounting pad bolt holes for damaged or missing shim washers. Replace missing washers as follows:

(1) Remove shim and adhesive debris with a nonmetallic scraper and scouring pad, Item 299, Appendix D.

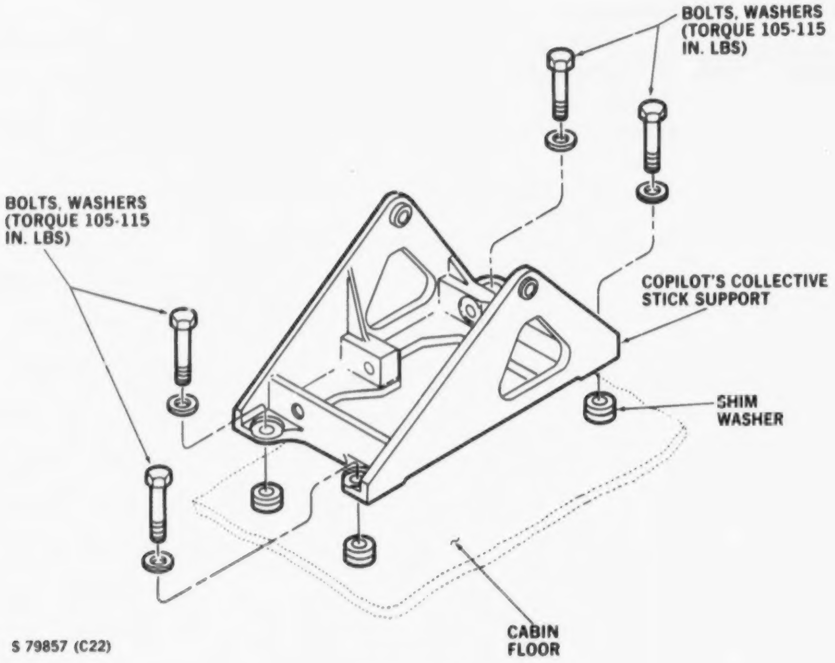

BOLTS, WASHERS (TORQUE 105-115 IN. LBS)
BOLTS, WASHERS (TORQUE 105-115 IN. LBS)
COPILOT'S COLLECTIVE STICK SUPPORT
SHIM WASHER
CABIN FLOOR
S 79857 (C22)

FIGURE 11-48

11-7.6 REPLACE COPILOT'S COLLECTIVE STICK SUPPORT 11-7.6

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.

- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Wipe washer and floor bonding contact surfaces clean with methyl ethyl ketone, Item 233, Appendix D, and clean cheesecloth, Item 98, Appendix D. Wipe parts until no stain shows on cloth after last wipe. Do not touch treated surfaces

(3) Apply adhesive, Item 31, Appendix D to shim washer and floor contact points. Do not get adhesive in bolt holes.

(4) Using bolt as a guide to center washer over bolt hole, press shim washer onto floor.

i. Loosely install pivot bolt through collective stick support pivot bushings.

j. Install copilot's collective stick support on cabin floor with washers and bolts. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

k. Turn collective stick pivot bolt with fingers. **NO BINDING ALLOWED.** A stuck or binding bolt shows that stick support is twisted due to one or more of the mount pads being higher than the rest. Unbolt support and peel shims as required until pivot bolt turns free with mounting bolts torqued as specified.

l. Install copilot's collective stick (PARA 11-7.3).

m. Install cover and boot (PARA 11-7.1).

n. Do an operational check of all switches (TM 55-1520-237-T).

o. Check collective angles (PARA 11-2).

11-8 COLLECTIVE STICK - REPAIR (AVIM) 11-8

PARAGRAPH BREAKDOWN

11-8.1	REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM)
11-8.2	REPLACE SOCKET (AVIM)
11-8.3	REPLACE BEARINGS (AVIM)
11-8.4	REPAIR COPILOT'S COLLECTIVE STICK (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68D - Aircraft Powertrain Repairer

MATERIALS/PARTS

- Adhesive, Item 31, Appendix D
- Alodine, Item 74, Appendix D
- Crocus Cloth, Item 128, Appendix D
- Cotter Pin, MS24665-155
- Degreasing Solvent, Item 131, Appendix D
- Dry-Cleaning Solvent, Item 135, Appendix D
- Grease, Item 168, Appendix D
- Loctite, Grade B, Item 208, Appendix D
- Lockwire, Item 203, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Paint Thinner, Item 258, Appendix D
- Primer, Item 269, Appendix D
- Primer, Item 276, Appendix D
- Silicone Fluid, Item 321, Appendix D
- Surface Primer, Grade T, Item 333, Appendix D
- Tiedown Strap, Item 361, Appendix D
- Tiedown Strap, Item 363, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Arbor Press, OO-P-636
- Bolt, 5/16-inch diameter, 1-1/2-inch shank
- Dial Indicator, MIL-I-18422
- Powertrain Repairer's Toolkit, SC 5180-99-CL-A13
- Reamer Set, GGG-R-00180
- Spring Scale, 0 - 50 lbs, AAA-S133
- Torque Wrench, 0 - 16 in. oz, GGG-W-00686
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686
- Twist Drill Set, GGG-D-751

REFERENCES

- PARA 1-6.3
- PARA 2-5
- PARA 9-11
- TM 55-1500-322-24

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1

REMOVE

a. Remove handgrip from stick (PARA 9-11).

b. If installed, remove rear tiedown strap from boot. Push boot back to expose upper end of drag strut.

c. Remove bolt, washers, and nut. Remove drag strut and shim from sleeve clevis.

d. Remove spacer from drag strut.

e. Slide friction grip and sleeve from stick.

f. If installed, remove front tiedown strap and remove boot from sleeve.

REPAIR

NOTE

Pilot's friction grip is repaired by replacing parts.

g. Repair pilot's friction grip prior to 70400-01401-048, -049, as follows:

(1) Remove special bolt and washer. Remove stop.

(2) Unscrew friction grip from sleeve.

(3) Remove stop and guard and collet halves and seal from sleeve.

(4) Remove retaining ring, retainer and scraper ring from front end of friction grip.

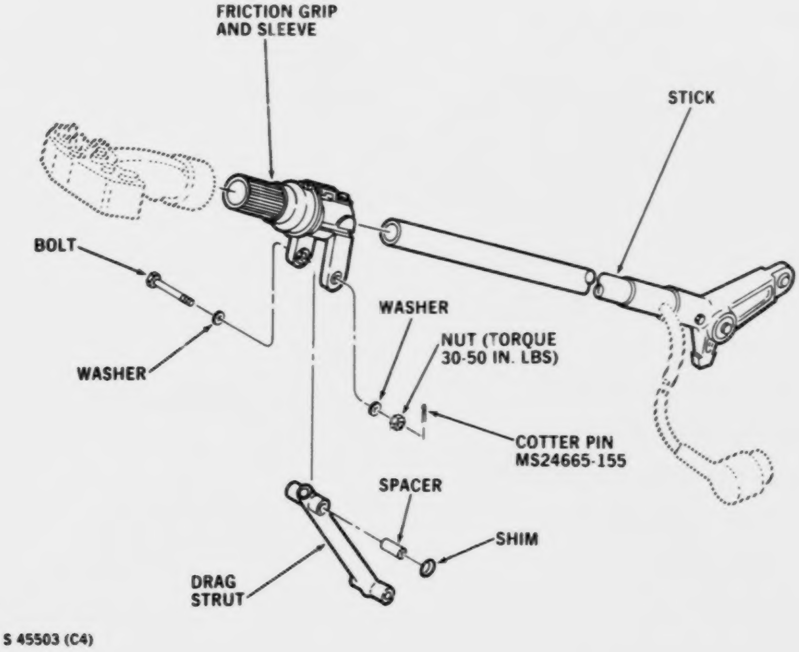

FRICTION GRIP AND SLEEVE
STICK
BOLT
WASHER
WASHER
NUT (TORQUE 30-50 IN. LBS)
COTTER PIN MS24665-155
SPACER
SHIM
DRAG STRUT
S 45503 (C4)

FIGURE 11-49

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1

(5) Clean all parts in dry-cleaning solvent, Item 135, Appendix D. Blow dry with dry compressed air.

(6) Inspect threads of friction grip and sleeve for nicks, dents, or any damage that would cause them to seize if screwed together.

(7) Thread friction grip in and out of sleeve to be sure it turns easily and smoothly for entire length of thread. Replace both parts if there is any doubt.

(8) Make sure collets are clean and free from any damage that might stop them from sliding smoothly on collective stick.

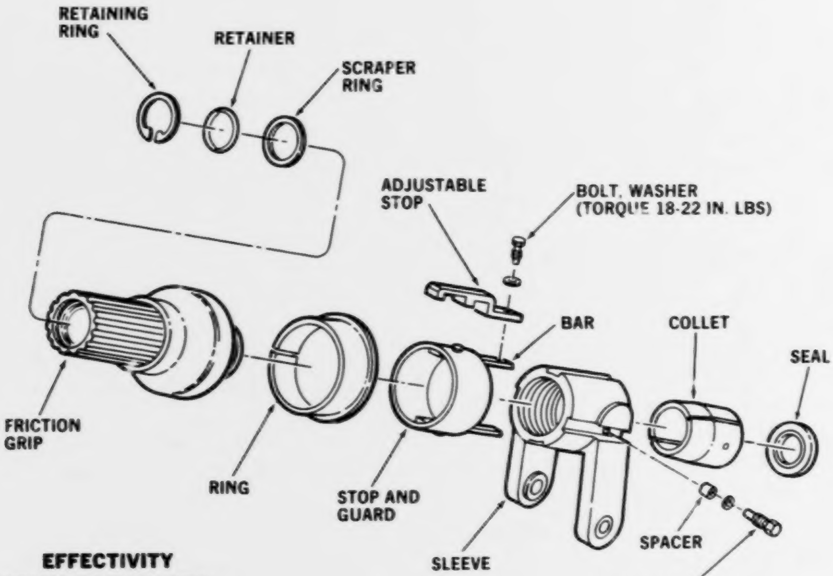
(9) Check ring on friction grip that it is bonded to grip. If loose, or if lip is damaged, remove ring from friction grip.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(10) Clean all bonding material from friction lock with methyl ethyl ketone, Item 233, Appendix D.

(11) Install replacement scraper ring in front of friction grip. Install retainer and retaining ring.


RETAINING RING
RETAINER
SCRAPER RING
ADJUSTABLE STOP
BOLT, WASHER (TORQUE 18-22 IN. LBS)
BAR
COLLET
SEAL
FRICTION GRIP
RING
STOP AND GUARD
SLEEVE
SPACER
SPECIAL BOLT, WASHER (TORQUE 18-22 IN. LBS)

EFFECTIVITY
COLLECTIVE STICKS PRIOR TO 70400-01401-048, -049

S 53995 (C18)

FIGURE 11-50

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1

CAUTION

When applying a light coat of silicone fluid to outside diameter of collet halves, make sure no fluid gets between collective stick and inner diameter of collet halves.

(12) Apply a light coat of silicone fluid, Item 321, Appendix D, to outside diameter of collet halves at tapered ends of collets.

(13) Install seal in collet halves and install collet in sleeve.

(14) Install stop and guard on sleeve, and thread friction grip in sleeve.

NOTE

Ring is bonded to friction grip after adjusting friction.

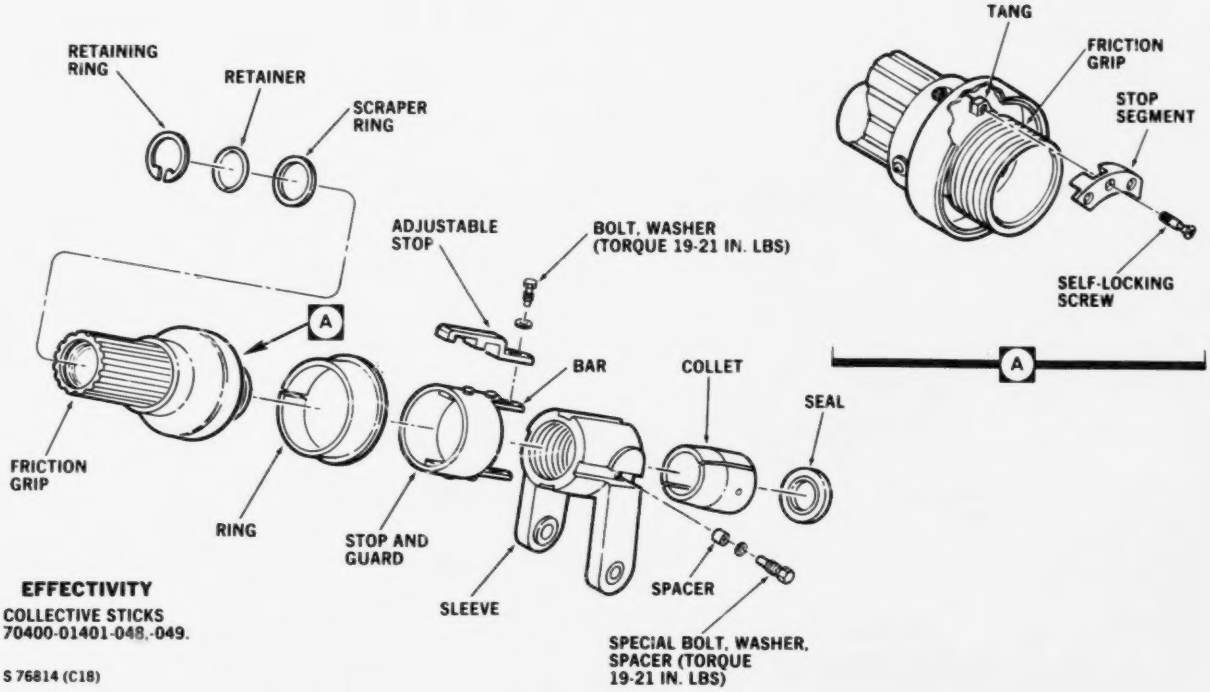
(15) Temporarily install adjustable stop on bar of stop and guard. Install special bolts and washers and special bolts, spacers, and washers through stop, stop and guard, sleeve, and collet halves.

h. To repair pilot's friction grip, 70400-01401-048, -049, do this:

(1) Remove bolt and washer and adjustable stop from friction grip.

(2) Unscrew friction grip from sleeve.

(3) Remove retaining ring, retainer, and scraper ring from friction grip.


RETAINING RING
RETAINER
SCRAPER RING
ADJUSTABLE STOP
BOLT, WASHER (TORQUE 19-21 IN. LBS)
A
BAR
COLLET
SEAL
FRICTION GRIP
RING
STOP AND GUARD
SLEEVE
SPACER
SPECIAL BOLT, WASHER, SPACER (TORQUE 19-21 IN. LBS)
TANG
FRICTION GRIP
STOP SEGMENT
SELF-LOCKING SCREW
A

EFFECTIVITY
COLLECTIVE STICKS
70400-01401-048,-049.

S 76814 (C18)

FIGURE 11-51

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1

(4) Remove stop segment from friction grip.

(5) Clean all parts in dry-cleaning solvent, Item 135, Appendix D. Blow dry with dry compressed air.

(6) Remove special bolts, washers, and spacer from stop and guard.

(7) Remove stop and guard from sleeve.

(8) Remove collet halves and seal from sleeve.

(9) Inspect threads of friction grip and sleeve for nicks, dents, or any damage that would cause them to seize when screwed together.

(10) Check that ring on friction grip is bonded to grip. If loose, or if lip is damaged, remove ring from friction grip.

(11) Thread friction grip in and out of sleeve to be sure it turns easily and smoothly for entire length of threads. Replace both parts if there is any doubt.

(12) Make sure collet halves are clean and free from any damage that might stop them from sliding smoothly on collective stick.

(13) Install collet halves and seal in sleeve.

(14) Temporarily install stop and guard and adjustable stop on sleeve with bolt, special bolt, and washers.

(15) Temporarily install special bolts, washers, and spacers in sleeve and collet halves.

(16) Temporarily install stop segment on end of friction grip using old self-locking screw.

NOTE

When adjusting friction, a new self-locking screw must be used for stop segment.

(17) Install scraper ring, retainer, and retaining ring in front of friction grip.

(18) Lightly coat threads of friction grip and sleeve with grease, Item 168, Appendix D, and thread friction grip in sleeve.

NOTE

When coating threads of friction grip and sleeve, make sure no grease will get between collective stick and collet halves when installing friction grip.

INSTALL

i. Check inside replacement friction grip and sleeve. Make sure bushing in grip and collets in sleeve are clean and free of any dirt, nicks, scratches, corrosion or other damage that could stop them from sliding smoothly on stick.

j. Check collective stick for dirt, nicks, scratches, corrosion or other damage that could stop friction lock and sleeve from sliding smoothly on stick.

k. Be sure stick, friction grip, and sleeve are clean and dry.

l. Slide sleeve on collective stick and measure force needed. If force is more than 1-1/2 pounds, check stick and collets for dirt or damage. Wipe clean if necessary and try sliding force again. Use a different sleeve or collective stick if necessary. Remove sleeve.

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1

m. Slide friction grip on collective stick and measure force needed. If force is more then 1-1/2 pounds, check stick and grip for dirt or damage. Wipe clean if necessary and try sliding force again. Use a different friction grip or collective stick if necessary. Remove sleeve.

n. If boot was removed, position new boot on sleeve and install tiedown strap, Item 361, Appendix D.

o. Pull boot up to expose sleeve clevis.

p. Install spacer in drag strut. Place drag strut end between ears of sleeve clevis. Install shims between spacer and clevis ears to allow 0.003 to 0.008-inch endplay.

q. Install bolt, washers, nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS.**

r. Check endplay again and add shims if necessary. Install cotter pin, MS24665-155.

s. If a boot was removed, slide end of boot over clevis and tube.

t. Slide sleeve and friction lock on stick.

NOTE

On collective sticks prior to 70400-01401-048, -049, friction locks operates as follows:

(1) As friction grip threads into sleeve it squeezes collet on collective stick.

(2) Amount of squeeze is set when lug on friction grip contacts stop and guard.

(3) If stop and guard is moved toward grip, lug will contact stop in less turns, squeeze is less.

(4) If stop and guard is moved away from grip, lug will contact stop in more turns, squeeze is more.

(5) Adjustable stop is set, so when ring touches stop, friction on stick is fully released. It prevents grip from coming out of sleeve completely and allows pilot to apply friction in only a few turns.

u. Adjust friction grip as follows:

(1) Turn friction grip to get desired friction.

(2) If adjustment is needed, back off friction grip, loosen special bolts, slide stop and guard in slots in sleeve, forward to loosen, back to tighten.

(3) If more adjustment is needed to loosen friction, turn stop and guard in same direction as loosening friction grip, and install in next set of slots in sleeve.

(4) To tighten friction, turn stop and guard in same direction as tightening friction grip, and install in sleeve.

(5) Adjust stop and guard so friction grip may be backed off without having lug on friction grip strike stop and guard after backing off one full turn.

v. After adjusting friction grip, ring should be bonded to friction grip.

w. Remove adjustable stop. Position ring on grip. Install adjustable stop on bar of stop and guard and over lip of ring.

x. Set ring and adjustable stop so friction grip may be backed off from locked position 2-1/2 to 3 full turns before ring hits adjustable stop.

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1

NOTE

On collective sticks, 70400-01401-048, -049, friction lock operates as follows:

(1) As friction grip threads into sleeve it squeezes collet halves on collective stick.

(2) Amount of squeeze is set when stop segment on friction grip contacts stop and guard.

(3) If friction grip is turned towards stop and guard, friction is increased.

(4) If friction grip is turned away from stop and guard, friction is decreased.

(5) Adjustable stop is set, so that when ring touches stop, friction on stick is fully released. It prevents friction grip from coming out of sleeve completely and allows pilot to apply friction in only a few turns.

y. Adjust friction grip as follows:

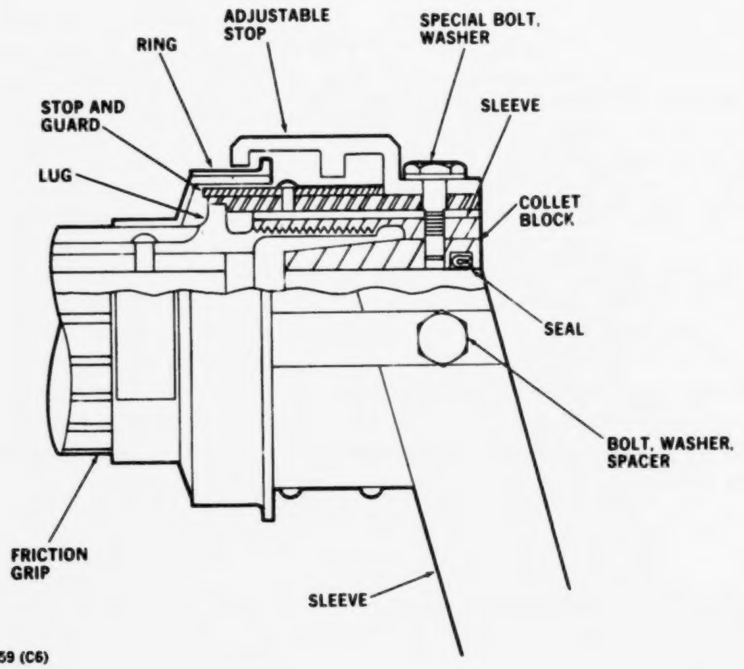
(1) Connect external electrical power or start APU (PARA 1-6.3).

(2) Make a pencil mark on outside of ring on friction grip to show position of tang on inside of friction grip.

(3) On upper console, place BACKUP HYD PUMP switch ON.

(4) Using spring scale attached to friction grip, turn friction grip until desired friction is obtained (20 - 40 pounds pull).

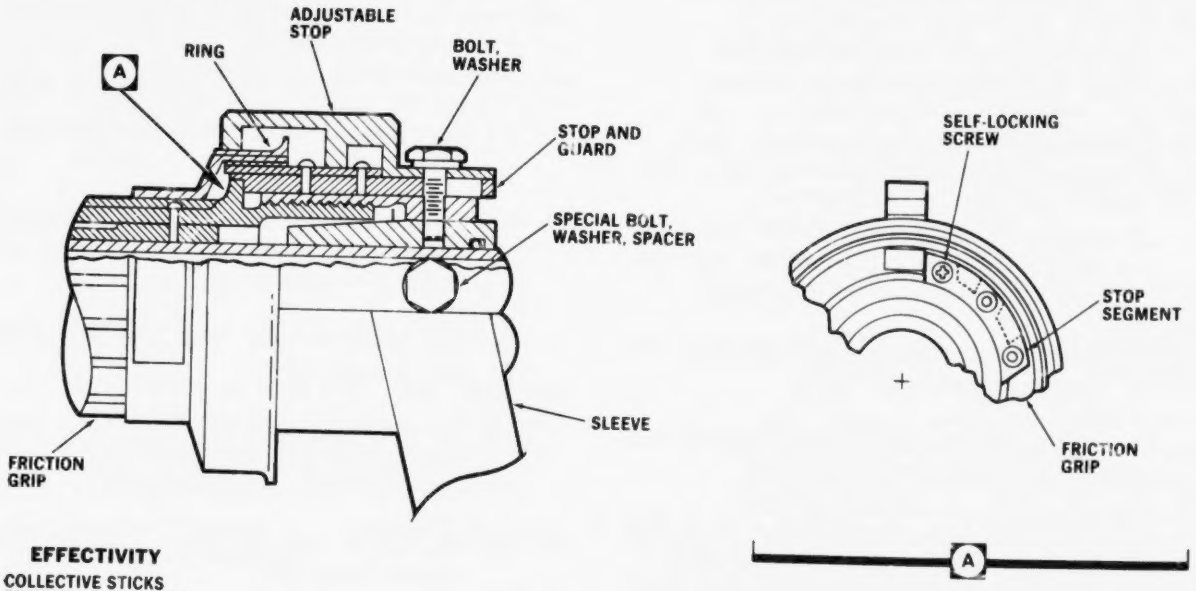
(5) On upper console, place BACKUP HYD PUMP switch OFF.


ADJUSTABLE STOP
RING
SPECIAL BOLT, WASHER
STOP AND GUARD
SLEEVE
LUG
COLLET BLOCK
SEAL
BOLT, WASHER, SPACER
FRICTION GRIP
SLEEVE

S 45559 (C6)

FIGURE 11-52

11-8.1 REPLACE/REPAIR PILOT'S FRICTION LOCK (AVIM) 11-8.1


A
RING
ADJUSTABLE STOP
BOLT, WASHER
STOP AND GUARD
SPECIAL BOLT, WASHER, SPACER
SLEEVE
FRICTION GRIP
SELF-LOCKING SCREW
STOP SEGMENT
FRICTION GRIP
A

EFFECTIVITY
COLLECTIVE STICKS
70400-01401-048,-049.

S 76815 (C18)

FIGURE 11-53

(6) Note distance between marked position of tang and nearest edge of first slot in sleeve that was passed. This distance will determine hole in stop segment that will be used when installing stop segment.

(7) Unscrew friction grip from sleeve and install stop of stop and guard in slot of sleeve noted in previous step.

(8) Install stop segment on friction grip with edge of stop segment as close as possible to stop on stop and guard, using self-locking screw.

NOTE

Do not reuse self-locking screw if friction must be readjusted.

(9) Slide stop and guard to front of collective stick to make positive contact between stop and stop segment. Check that stop and guard has not slid far enough to prevent friction grip to be backed off at least one turn. If one turn cannot be obtained, use a nonmetallic drift and tap stop and guard back until grip can be turned one full turn.

(10) On upper console, place BACKUP HYD PUMP switch ON.

(11) Check to be sure friction grip is in positive stop.

(12) Using spring scale attached to friction grip, check for 20 - 40 pounds pull to move collective stick.

NOTE

Self-locking screw must not be reused.

(13) If desired friction was not obtained, unscrew friction grip far enough to get to stop segment. Remove self-locking screw from stop segment, and adjust stop segment as needed. Install new self-locking screw in stop segment.

(14) Reinstall friction grip in sleeve and recheck force to move collective stick.

(15) If correct friction cannot be obtained after adjusting stop segment, remove friction grip and reposition stop of stop and guard in next slot of sleeve past pencil mark. Repeat adjustment procedures until correct friction is obtained.

(16) On upper console, place BACKUP HYD PUMP switch OFF.

(17) Set adjustable stop so friction grip can be backed off from locked position 2-1/2 to 3 full turns before ring touches stop.

(18) Install bolt and washer in adjustable stop. **TORQUE BOLT TO 19 - 21 INCH-POUNDS.**

(19) Install special bolt and washer in stop of stop and guard. Install special bolts, washers, and spacers in sleeve and collet halves. **TORQUE BOLTS TO 19 - 21 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts in pairs.

(20) Disconnect external electrical power or shut down APU (PARA 1-6.3).

z. To bond ring in this position using adhesive, Item 31, Appendix D, do this:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Clean area where ring is to be bonded using a clean cloth dampened in methyl ethyl ketone, Item 233, Appendix D.

(2) Mix adhesive, Item 31, Appendix D, in ratio of 100 parts by weight of part A to 22 parts by weight of part B.

(3) Apply a light coat of adhesive to area of friction grip where ring is installed. Install ring on friction grip.

(4) Allow adhesive to cure at 120° ±10°F (49° ±5°C) for at least 2 hours.

aa. Attach boot to stick using tiedown strap, Item 363, Appendix D.

ab. Install handgrip on stick (PARA 9-11).

11-8.2 REPLACE SOCKET (AVIM) 11-8.2

REMOVE

NOTE

Collective stick and socket are a matched assembly. Line-reaming may be necessary when assembling a used part with a new or unmatched used part. Mark collective sticks and sockets to assure reassembly with matched parts.

a. Unbolt and remove socket from stick.

b. If necessary, use paint thinner, Item 258, Appendix D, to dissolve old primer.

c. Check socket assembly as follows:

  (1) Inspect socket for nicks, gouges, cracks, and corrosion. Nicks and small gouges up to 0.020 inch deep by 1/16 inch wide by 1/2 inch long should be blended out with crocus cloth, Item 128, Appendix D. No cracks or corrosion is allowed. If damage is more than allowed, replace socket.

  (2) Apply Alodine, Item 74, Appendix D, to reworked area. Touch up paint (PARA 2-5).

  (3) Check bearing rotational drag (PARA 11-8.3).

  (4) Inspect bearing for ratcheting, binding and side play (TM 55-1500-322-24). Check bearing radial play with a dial indicator. **MAXIMUM RADIAL PLAY IS 0.005 INCH.** Replace worn or damaged bearings (PARA 11-8.4).

INSTALL

d. Place socket on stick and line up boltholes.

e. Put bolt through socket and stick. If bolt fits, do not ream hole.

f. If reaming is required, place stick in socket to depth shown (Figure 11-54, Details A and B), line up pilot hole and boltholes, and line-ream hole to 0.3107-0.3117-inch diameter.

g. Remove socket and clean away metal chips.

h. Coat inside of socket hole with primer, Item 276, Appendix D.

i. Install socket on stick. Install bolt, washers, and nut. **TORQUE NUT TO 157 - 173 INCH-POUNDS.**

j. On copilot's collective stick, place special washers on each side of tube and install bolt, washers and nut. **TORQUE NUT TO 80 - 100 INCH-POUNDS.**

NOTE

Be sure bolt goes between wire cords (Figure 11-54, Detail B).

11-8.2 REPLACE SOCKET (AVIM) 11-8.2

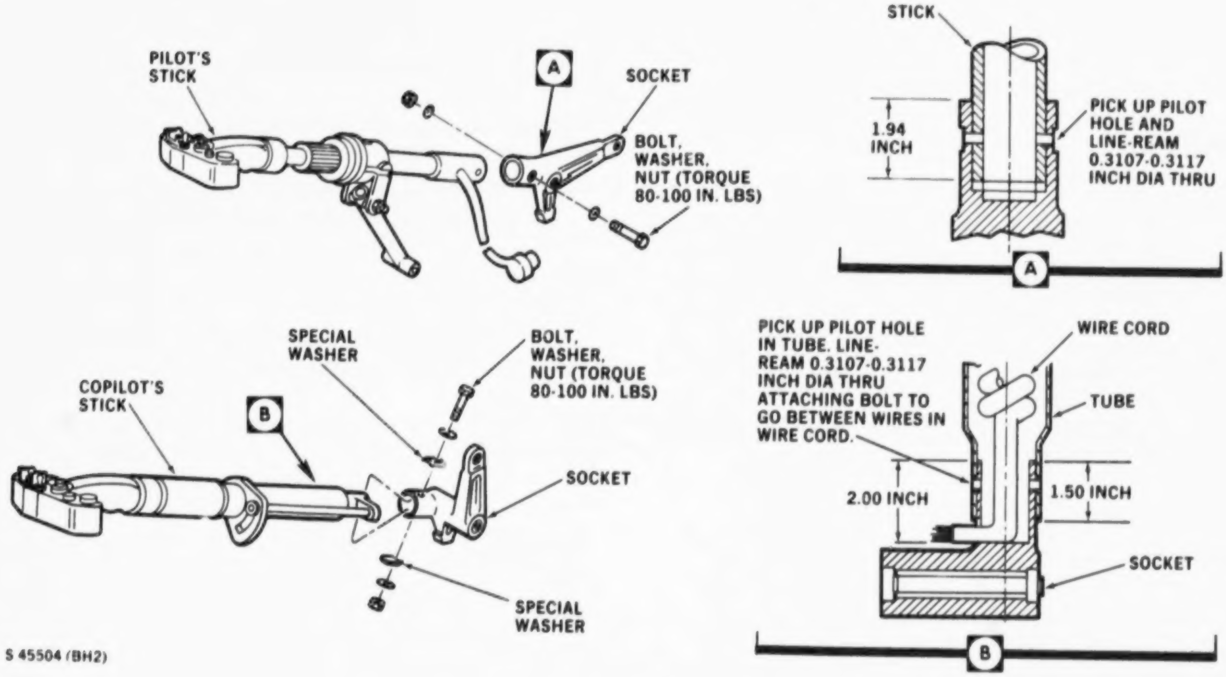

PILOT'S STICK
A
SOCKET
BOLT, WASHER, NUT (TORQUE 80-100 IN. LBS)
STICK
1.94 INCH
PICK UP PILOT HOLE AND LINE-REAM 0.3107-0.3117 INCH DIA THRU
A
SPECIAL WASHER
BOLT, WASHER, NUT (TORQUE 80-100 IN. LBS)
COPILOT'S STICK
B
SOCKET
SPECIAL WASHER
PICK UP PILOT HOLE IN TUBE. LINE-REAM 0.3107-0.3117 INCH DIA THRU ATTACHING BOLT TO GO BETWEEN WIRES IN WIRE CORD.
WIRE CORD
TUBE
2.00 INCH
1.50 INCH
SOCKET
B
S 45504 (BH2)

FIGURE 11-54

11-8.3 REPLACE BEARINGS (AVIM) 11-8.3

REMOVE

a. Remove socket from stick (PARA 11-8.2).

b. Press bearings from socket using a suitable arbor press and step-type bearing remover.

INSPECT

c. Inspect bearings, MKSP4A-A1173, MKSP4A-400, MKSP4A-5A2922, and bearing MKP5A-A1173, in pilot's and copilot's collective stick socket, 70400-01412-041, -042, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN BEARINGS, MKSP4A-A1173, MKSP4A-400, AND MKSP4A-5A2922 IS 0.0025-INCH. MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARING, MKP5A-A1173, IS 0.005-INCH.**

INSTALL

CAUTION

Do not get solvent into bearing.

d. Clean inside diameter of socket, outside diameter of spacer, and outside diameter of bearing with degreasing solvent, Item 131, Appendix D.

e. Coat outside of spacer with surface primer, Grade T, Item 333, Appendix D, and install spacer in socket.

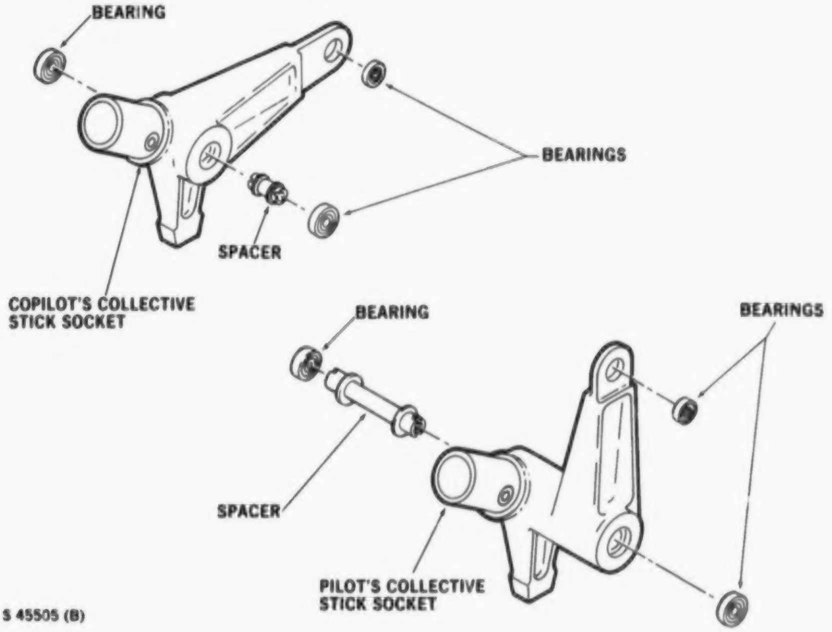

BEARING
BEARINGS
SPACER
COPILOT'S COLLECTIVE STICK SOCKET
BEARING
BEARINGS
SPACER
PILOT'S COLLECTIVE STICK SOCKET
S 45505 (B)

FIGURE 11-55

11-8.3 REPLACE BEARINGS (AVIM) 11-8.3

CAUTION

Do not get primer in bearing.

f. Apply a light coat of surface primer, Grade T, Item 333, Appendix D, to outside diameter of bearing and inside diameter of socket. Allow to air-dry for at least 30 seconds.

g. Apply about a 1/16-inch bead of loctite, Grade B, Item 208, Appendix D, to leading edge of bearing outside diameter and leading edge of socket bore. Bead should be all around edges.

h. Within 10 minutes after applying surface primer, press bearings in socket.

i. Using a cloth damp with degreasing solvent, Item 131, Appendix D, wipe surfaces of bearings clean of any surface primer. Be careful not to get primer or solvent in bearings.

j. Allow at least 10 minutes for primer to dry before handling socket or bearings.

NOTE

- Surface primer and loctite should be from same manufacturer.
- Surface primer exposed to air will not dry.

k. Do a rotational drag check of bearings as follows:

(1) Install a 5/16-inch diameter bolt through bearing(s) and secure with nut.

(2) Using a torque wrench and socket, turn bolt head and measure rotational drag of bearings.

(3) **IF DRAG IS GREATER THAN 10 INCH-OUNCES, REPLACE BEARINGS.**

(4) Remove bolt from socket.

11-8.4 REPAIR COPILOT'S COLLECTIVE STICK (AVIM) 11-8.4

REPAIR

NOTE

Copilot's collective stick is repaired by replacing grip, socket or tube assembly.

a. Remove grip (PARA 9-11).

b. Remove socket (PARA 11-8.2).

INSTALL

c. Check outside diameter of tube assembly for cleanness, nicks, scratches, corrosion or other damage.

d. Check that tubes slide easily together or apart.

e. Replace tube if necessary.

f. No repairs are allowed to tube assembly.

g. Install grip on upper tube (PARA 9-11).

h. Install socket on lower tube (PARA 11-8.2).

11-9 YAW BOOST SERVO 11-9

PARAGRAPH BREAKDOWN

11-9.1 REPLACE YAW BOOST SERVO
11-9.2 REPLACE PRESSURE SWITCH AND THERMAL RELIEF VALVE
11-9.3 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 2, Appendix D
- Alcohol, Item 72, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-155
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, M83461/1-006
- Packing, M83461/1-011
- Packing, MS28778-6
- Rags
- Lead, Seal, 81264
- Sealing Compound, Item 312, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- PARA 7-3
- PARA 11-2
- PARA 11-27
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-9.1 REPLACE YAW BOOST SERVO 11-9.1

NOTE

On the yaw boost servo, if SAS actuator and SAS controller are to be removed, send boost servo to intermediate level maintenance.

REMOVE

a. Turn off all electrical and hydraulic power.

b. Open main rotor pylon sliding cover.

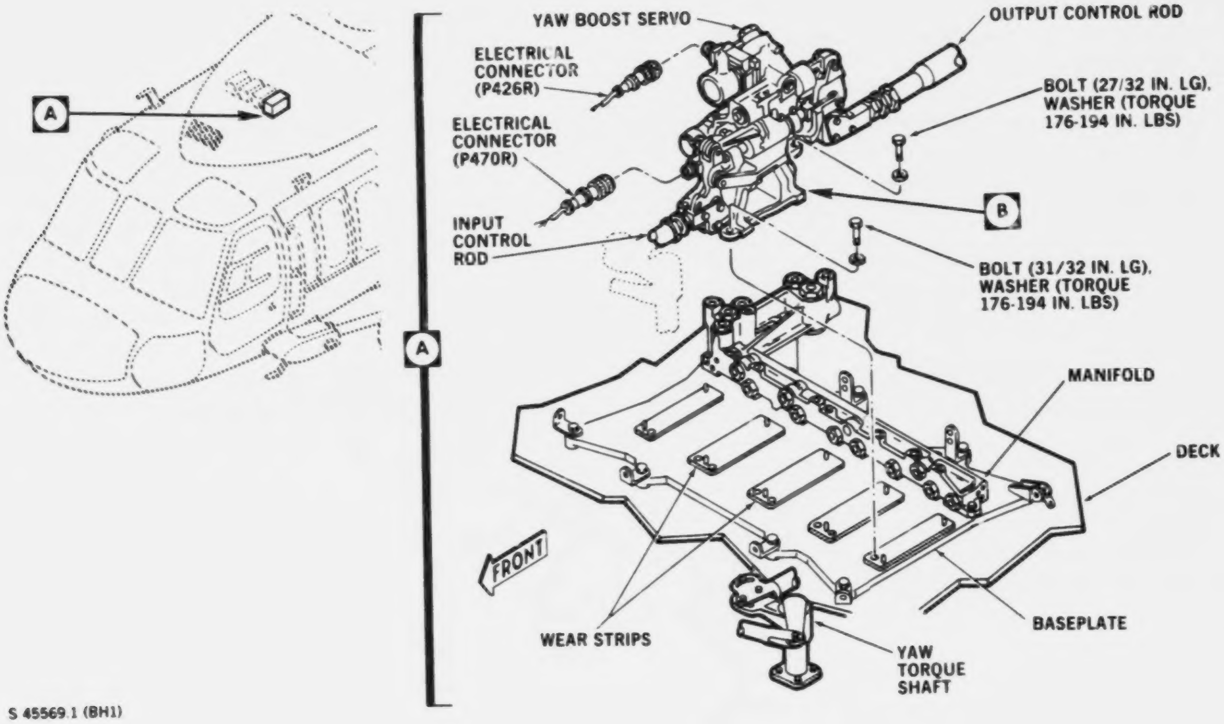

A
YAW BOOST SERVO
OUTPUT CONTROL ROD
ELECTRICAL CONNECTOR (P426R)
BOLT (27/32 IN. LG), WASHER (TORQUE 176-194 IN. LBS)
ELECTRICAL CONNECTOR (P470R)
B
INPUT CONTROL ROD
BOLT (31/32 IN. LG), WASHER (TORQUE 176-194 IN. LBS)
A
MANIFOLD
DECK
FRONT
BASEPLATE
WEAR STRIPS
YAW TORQUE SHAFT
S 45569.1 (BH1)

FIGURE 11-56 (SHEET 1 OF 2)

11-9.1 REPLACE YAW BOOST SERVO 11-9.1

c. If main rotor blades are installed, turn main rotor head to allow overhead clearance and make it easier to remove yaw boost servo assembly.

CAUTION

Do not store self-retaining bolts in rod end bearings.

d. Remove yaw servo input control rod (PARA 11-27).

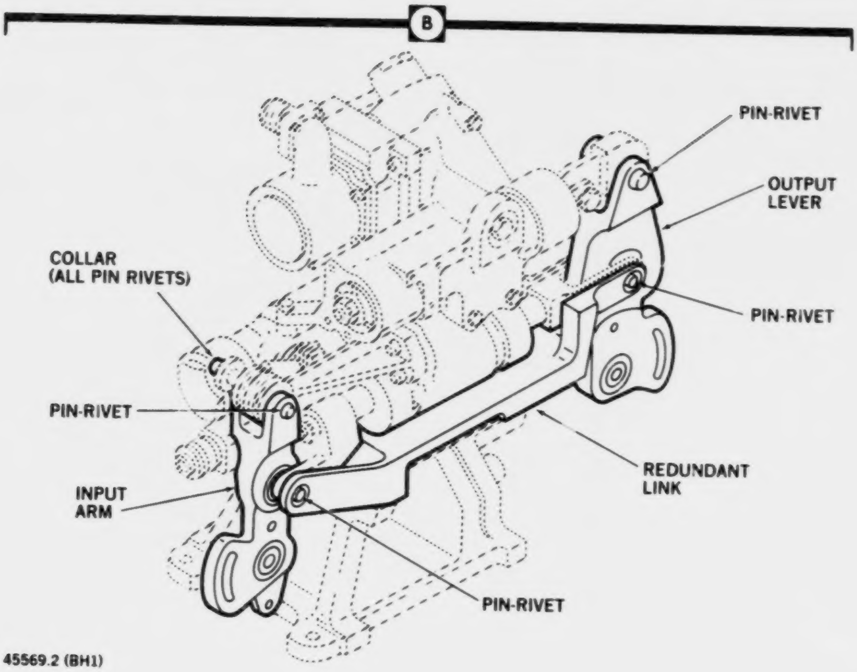

B
PIN-RIVET
OUTPUT LEVER
COLLAR (ALL PIN RIVETS)
PIN-RIVET
PIN-RIVET
INPUT ARM
REDUNDANT LINK
PIN-RIVET
S 45569.2 (BH1)

FIGURE 11-56 (SHEET 2 OF 2)

11-9.1 REPLACE YAW BOOST SERVO 11-9.1

e. Unbolt front end of yaw control rod at servo arm (PARA 11-27).

f. Disconnect electrical connectors from SAS servo valve and pressure switch.

g. Unbolt boost servo from baseplate and manifold.

CAUTION

Do not drop servo when removing, or internal damage will result.

h. Carefully pull boost servo forward to separate servo self-sealing couplings from manifold.

i. Cover boost servo and manifold to keep dirt from entering hydraulic system.

INSPECT

j. Visually inspect both input and output power piston shafts for cracks or evidence of separation of shaft from clevis end. **NO CRACKS OR SEPARATION ALLOWED.**

k. Visually inspect cylinder for evidence of cracks. **NO CRACKS OR SEPARATION ALLOWED.**

l. Replace yaw boost servo if cracks or separation is found.

m. Check all servo pin-rivet connections (Figure 11-56, Detail B) as follows:

(1) Pin-rivets attaching redundant link to input arm, and output lever shall not rotate in link assembly. Axial motion of pin rivet assemblies is not allowed. **REPLACE SERVOS NOT WITHIN LIMITS. NO REPAIR ALLOWED.**

(2) Pin-rivets in upper connection of input arm may or may not rotate in arm assembly.

(3) Pin-rivets in upper connection of output lever may or may not rotate in lever assembly.

(4) Bushings and collars shall not rotate or move axially with respect to pin-rivets on any of the servo connections. **REPLACE SERVOS NOT WITHIN LIMITS. NO REPAIR ALLOWED.**

(5) Check axial play of upper bushings and pin-rivet connections. If combined feeler gage readings between pinned parts exceeds 0.020 inch on any connection point, **REPLACE SERVO. NO REPAIR ALLOWED.**

INSTALL

n. Turn off all electrical and hydraulic power.

CAUTION

Do not drop servo when installing, or internal damage will result.

o. Remove cover from replacement yaw boost servo and from manifold.

p. Make sure manifold and servo self-sealing couplings are clean. If needed wipe with clean rags and flush with alcohol, Item 72, Appendix D.

q. Remove old sealing compound from mounting holes and deck area using a nonmetallic scraper.

r. Remove paint from bottom of servo feet using abrasive cloth, Item 2, Appendix D.

s. Thoroughly wipe deck mounting area and servo feet with clean rags and alcohol, Item 72, Appendix D. Final wiping must be in one direction only, and followed by a repeat wipe with a clean, unused rag.

t. Position servo feet up. Apply a continuous bead of sealing compound, Item 312, Appendix D, in a D-shaped pattern around the bottom edge of each foot. **DO NOT COVER ENTIRE FOOT.**

u. Position servo over mounting holes as close to manifold couplings as possible.

v. Carefully slide servo toward manifold and connect self-sealing couplings between servo and manifold.

w. Line up output control rod clevis with boost servo arm while sliding servo toward manifold.

11-9.1 REPLACE YAW BOOST SERVO 11-9.1

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of bolts are critical characteristics.

x. Attach boost servo to manifold and to baseplate with bolts and washers. **TORQUE BOLTS TO 176 - 194 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts. Apply slippage mark.

y. Apply a bead of sealing compound, Item 312, Appendix D, around each bolthead and check that there is a bead of sealing compound showing between the feet and deck.

NOTE

Forward and rear bolts are different lengths. Bolts attached to manifold are 27/32 inch long. Bolts attaching to baseplate are 31/32 inch long.

z. Install yaw control rod on yaw servo arm (PARA 11-27).

aa. Install yaw servo input control rod (PARA 11-27).

ab. Connect electrical connector P462R to SAS servo valve and connector P470R to pressure switch.

ac. Do a rigging check (PARA 11-2).

ad. Do an operational check of No. 2 hydraulic system (TM 55-1520-237-T).

ae. Make sure area is clean and free of foreign objects before closing cover.

af. Close main rotor pylon sliding cover.

ag. Do a maintenance test flight (TM 55-1520-237-MTF).

11-9.2 REPLACE PRESSURE SWITCH AND THERMAL RELIEF VALVE 11-9.2

CAUTION

To avoid getting dirt in components, make sure yaw boost servo is clean before disassembly. Have replacement switch or valve ready for installation before old switch or valve is removed.

REMOVE

a. Using wrench flats, unscrew pressure switch from yaw servo.

b. Remove packings from pressure switch.

c. Unscrew thermal relief valve from yaw servo.

d. Remove packing from valve.

INSTALL

NOTE

Before installing thermal relief valve and pressure switch, coat packings and threads with hydraulic fluid, Item 174, Appendix D.

e. Install packing, M83461/1-011, on new thermal relief valve and screw valve in yaw servo. **TORQUE VALVE TO 25 - 30 INCH-POUNDS.** Lockwire, Item 199, Appendix D, valve to servo. Install lead seal on lockwire.

f. Install packings, M83461/1-011 and MS28778-6 on pressure switch. Using wrench flats, screw switch into yaw servo. **TORQUE PRESSURE SWITCH TO 142 - 157 INCH-POUNDS.** Lockwire, Item 199, Appendix D. Install lead seal on lockwire.

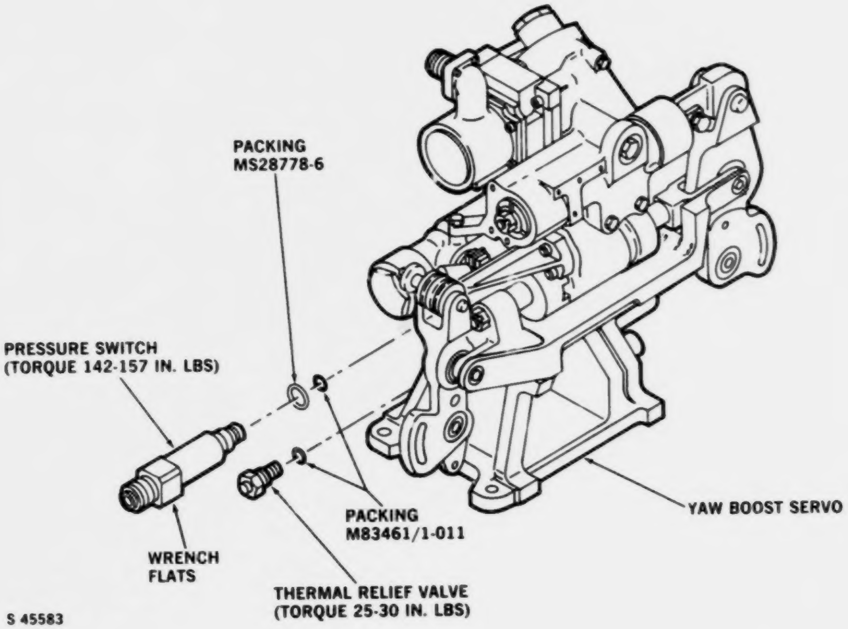

PACKING
MS28778-6
PRESSURE SWITCH
(TORQUE 142-157 IN. LBS)
WRENCH
FLATS
PACKING
M83461/1-011
THERMAL RELIEF VALVE
(TORQUE 25-30 IN. LBS)
YAW BOOST SERVO
S 45583

FIGURE 11-57

11-9.3 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING 11-9.3

REMOVE

a. Remove SAS actuator bleed screw (Figure 11-58). Remove and discard bleed screw packing.

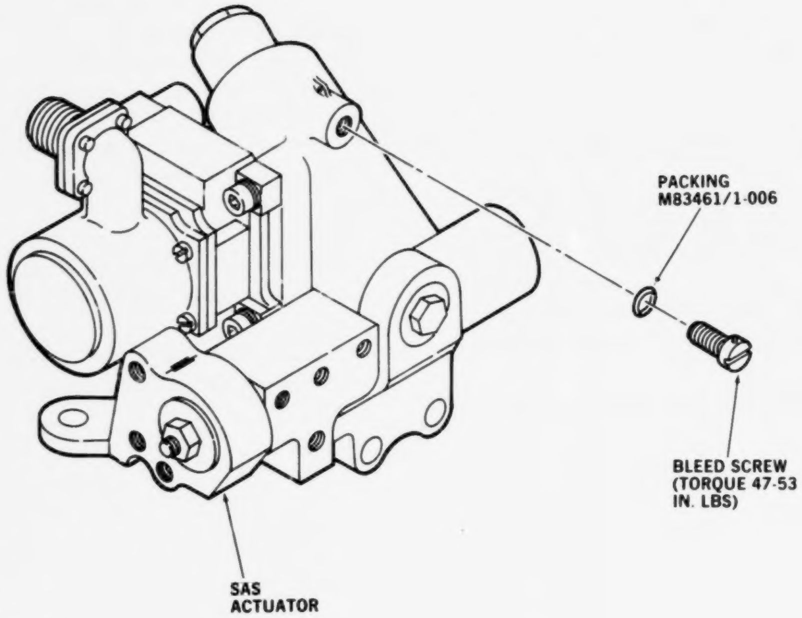
b. Clean screw with alcohol, Item 72, Appendix D. Blow out screw bleed port with dry, filtered, compressed air.

INSTALL

c. Coat new packing, M83461/1-006 and screw threads with hydraulic fluid, Item 174, Appendix D.

d. Install packing on screw. Install screw in SAS actuator. **TORQUE SCREW TO 47 - 53 INCH-POUNDS.** Lockwire, Item, 198, Appendix D.

e. Check bleed screw installation for leakage (PARA 7-2).


PACKING
M83461/1-006
BLEED SCREW
(TORQUE 47-53
IN. LBS)
SAS
ACTUATOR

S 79846 (C22)

FIGURE 11-58

11-10 YAW BOOST SERVO - REPAIR (AVIM) 11-10

PARAGRAPH BREAKDOWN

11-10.1 REPLACE SAS SERVOVALVE (AVIM)
11-10.2 REPLACE SAS ACTUATOR (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68H - Aircraft Pneudraulic Repairer

MATERIALS/PARTS

- Cotter Pin, MS24665-153
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, M83461/1-010
- Packing, M83461/1-013
- Seal, CEC 4981-011

TOOLS

- Hydraulic Repairer's Toolkit, SC 5180-99-CL-A03
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 11-1
- TM 55-1520-237-T

11-10.1 REPLACE SAS SERVOVALVE (AVIM) 11-10.1

REMOVE

CAUTION

- Handle SAS servovalve with extreme care. If servovalve is bumped or jarred, servovalve calibration will be disturbed.

- To avoid getting dirt in components, make sure yaw boost servo is clean before disassembly. Replacement of the SAS servovalve should be done only in a clean place. Replacement servovalve should be ready for installation. Shipping cover, when available, should be transferred to old servo. When removing new SAS servovalve from shipping cover, do not allow followup wire to contact any surface. If followup wire contacts any surface, calibration will be disturbed, and SAS servovalve must be replaced.

a. Remove screws and remove servovalve carefully, so as not to damage followup wire.

b. Remove shipping cover, if installed, from replacement servovalve, and install on old servovalve.

INSTALL

CAUTION

When installing servovalve, use care to properly position followup wire into SAS actuator. Followup wire sticks out of servovalve. It must be carefully put in hole of SAS actuator. Do not allow followup wire to contact any surface. If followup wire contacts any surface, SAS servovalve calibration will be disturbed.

c. Coat packing, M83461/1-013, and packings, M83461/1-010, with hydraulic fluid, Item 174, Appendix D, and install on servovalve.

d. Position servovalve on SAS actuator so followup wire lines up with hole in SAS actuator, and carefully install servovalve on SAS actuator.

e. Install screws and washers in servovalve. **CAREFULLY TIGHTEN SCREWS IN A CRISS-CROSS PATTERN UNTIL SERVOVALVE IS FULLY SEATED AGAINST SAS ACTUATOR. TORQUE SCREWS TO 24 - 26 INCH-POUNDS.**

f. Lockwire, Item 198, Appendix D, screws.

11-10.1 REPLACE SAS SERVOVALVE (AVIM) 11-10.1

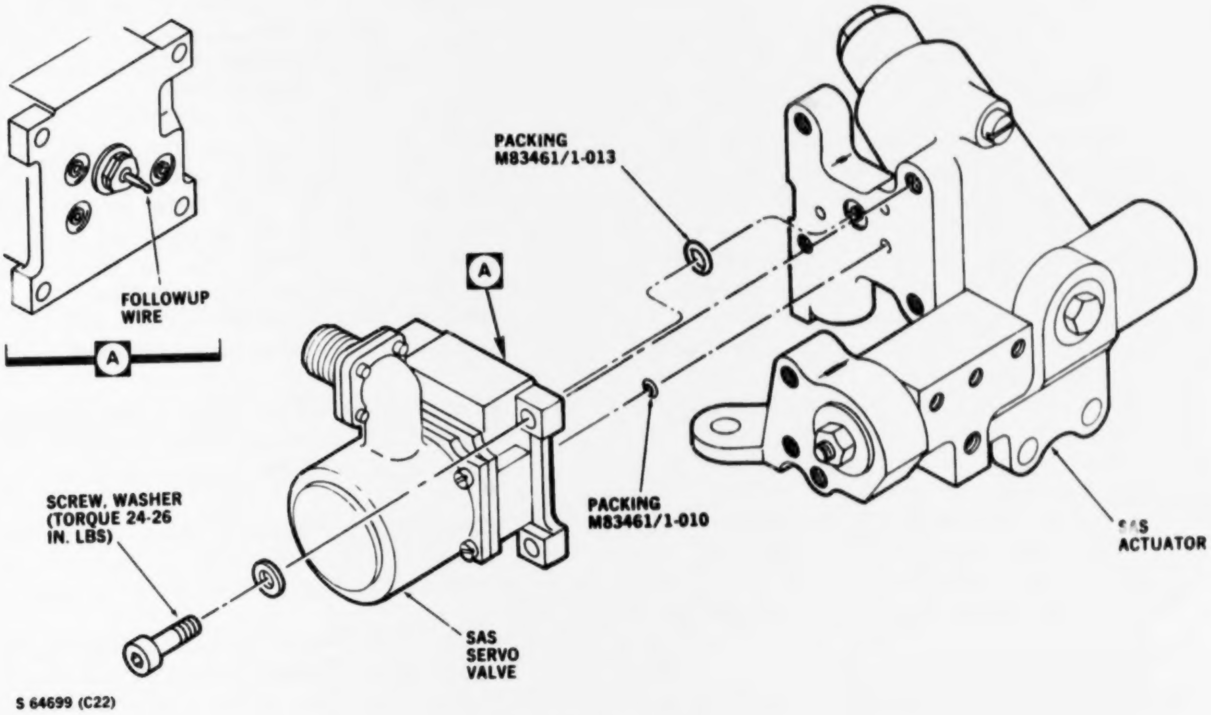

PACKING
M83461/1-013
A
FOLLOWUP
WIRE
A
SCREW, WASHER
(TORQUE 24-26
IN. LBS)
PACKING
M83461/1-010
SAS
ACTUATOR
SAS
SERVO
VALVE
S 64699 (C22)

FIGURE 11-59

11-10.2 REPLACE SAS ACTUATOR (AVIM) 11-10.2

CAUTION

To avoid getting dirt in components, make sure yaw boost servo is clean before disassembly. Replace SAS actuator only in a clean place. Have replacement actuator ready for installation before old actuator is removed.

REMOVE

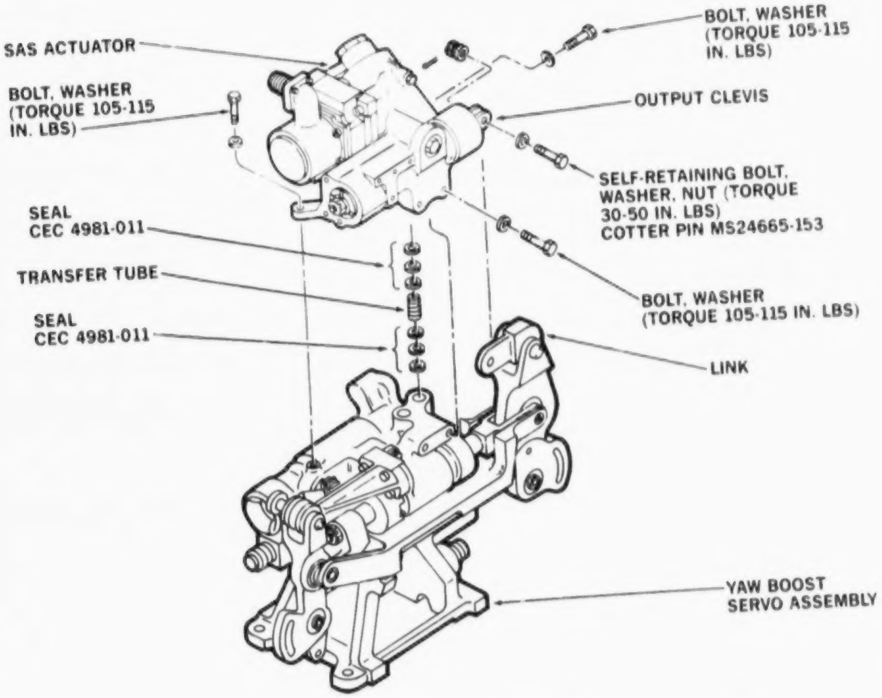
a. Unbolt SAS actuator output clevis from link.

b. Unbolt SAS actuator from yaw boost servo assembly. Carefully lift actuator straight up and remove transfer tubes. Remove seals from transfer tubes.

INSTALL

c. Coat seals with hydraulic fluid, Item 174, Appendix D, before installing.

d. Install new seals, CEC 4981-011, on both transfer tubes. Install transfer tubes in pitch/trim assembly.


SAS ACTUATOR
BOLT, WASHER (TORQUE 105-115 IN. LBS)
BOLT, WASHER (TORQUE 105-115 IN. LBS)
OUTPUT CLEVIS
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SEAL CEC 4981-011
TRANSFER TUBE
SEAL CEC 4981-011
BOLT, WASHER (TORQUE 105-115 IN. LBS)
LINK
YAW BOOST SERVO ASSEMBLY

S 45582 (BH4)

FIGURE 11-60

11-10.2 REPLACE SAS ACTUATOR (AVIM) 11-10.2

e. Carefully install replacement actuator on yaw boost servo assembly, making sure transfer tubes line up with holes in actuator. Install bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

f. Install SAS actuator output clevis to link.

g. Install self-retaining bolt and washers (under head) (PARA 11-1).

h. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

i. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

j. Do an operational check of yaw boost servo (TM 55-1520-237-T).

11-11 PITCH/TRIM ASSEMBLY 11-11

PARAGRAPH BREAKDOWN

11-11.1	REPLACE PITCH/TRIM ASSEMBLY
11-11.2	REPLACE SAS ACTUATOR BLEED SCREW AND PACKING

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 2, Appendix D
- Alcohol, Item 72, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-155
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, M83461/1-006
- Rags
- Sealing Compound, Item 312, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01,
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- PARA 7-2
- PARA 11-1
- PARA 11-2
- PARA 11-27
- TM 11-1520-237-23-2
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-11.1 REPLACE PITCH/TRIM ASSEMBLY 11-11.1

NOTE

Procedures are for replacing pitch/trim assembly. If SAS actuator, and SAS servo valve are to be removed, send pitch/trim assembly to intermediate level maintenance.

REMOVE

a. Open main rotor pylon sliding cover.

b. If main rotor blades are installed, turn main rotor head to allow overhead clearance and make it easier to remove pitch/trim assembly.

c. Turn off all electrical and hydraulic power.

d. Disconnect electrical connectors from servo assembly.

e. Disconnect input control rod from torque shaft lever and servo arm (PARA 11-27).

f. Disconnect mixer link from pitch/trim assembly arm (PARA 11-27).

g. Unbolt servo from baseplate (two bolts) and from manifold (one bolt).

CAUTION

Do not drop servo when removing, or internal damage will result.

h. Carefully pull servo forward to separate servo self-sealing couplings from manifold.

i. Cover assembly and manifold to prevent getting dirt in hydraulic system.

j. Remove old sealing compound from mounting holes and deck area using a nonmetallic scraper.

k. Remove paint from bottom of servo feet using abrasive cloth, Item 2, Appendix D.

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

l. Turn off all electrical and hydraulic power.

m. Remove cover from replacement pitch/trim boost servo and from manifold. Make sure manifold and servo self-sealing couplings are clean. Wipe with clean rags and flush with alcohol, Item 72, Appendix D.

n. Thoroughly wipe deck mounting area and servo feet with clean rags and alcohol, Item 72, Appendix D. Final wiping must be in one direction only, and followed by a repeat wipe with a clean, unused rag.

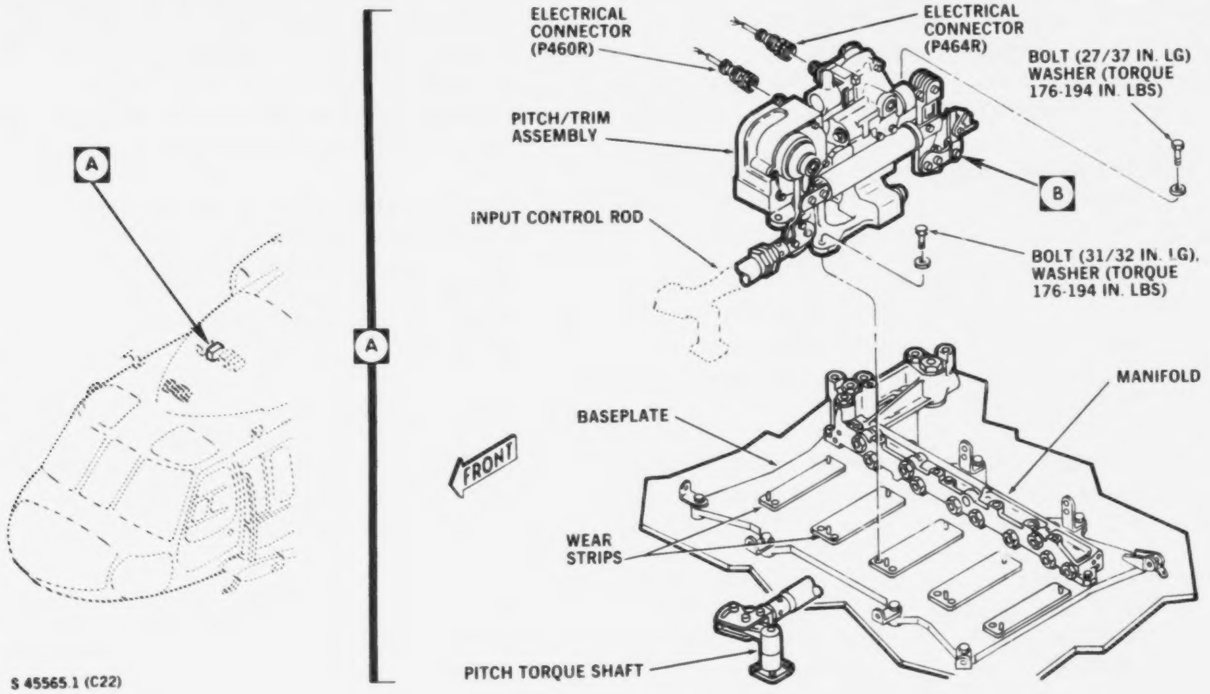
CAUTION

Do not drop servo when installing or internal damage will result.

o. Position servo feet up. Apply a continuous bead of sealing compound, Item 312, Appendix D, in a D-shaped pattern around the bottom edge of each foot. **DO NOT COVER ENTIRE FOOT.**

p. Position servo over mounting holes as close to manifold couplings as possible.

11-11.1 REPLACE PITCH/TRIM ASSEMBLY 11-11.1


A
ELECTRICAL CONNECTOR (P460R)
ELECTRICAL CONNECTOR (P464R)
BOLT (27/37 IN. LG) WASHER (TORQUE 176-194 IN. LBS)
PITCH/TRIM ASSEMBLY
B
INPUT CONTROL ROD
BOLT (31/32 IN. LG), WASHER (TORQUE 176-194 IN. LBS)
MANIFOLD
BASEPLATE
FRONT
WEAR STRIPS
PITCH TORQUE SHAFT
S 45565.1 (C22)

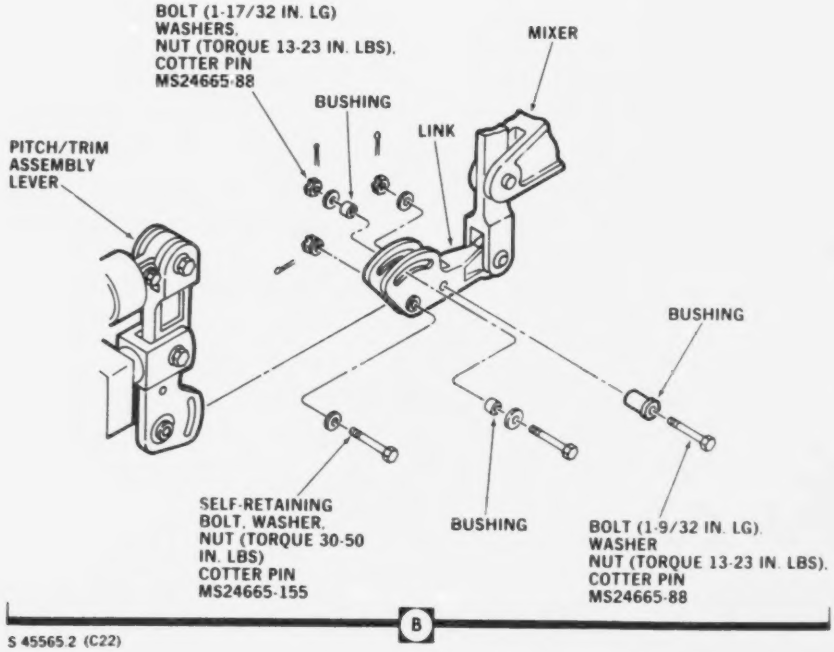

BOLT (1-17/32 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS), COTTER PIN MS24665-88
MIXER
BUSHING
LINK
PITCH/TRIM ASSEMBLY LEVER
BUSHING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BUSHING
BOLT (1-9/32 IN. LG), WASHER NUT (TORQUE 13-23 IN. LBS), COTTER PIN MS24665-88
B
S 45565.2 (C22)

FIGURE 11-61

11-11.1 REPLACE PITCH/TRIM ASSEMBLY 11-11.1

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of bolts are critical characteristics.

NOTE

Bolt attached to manifold is 27/32 inch long. Bolts attached to baseplate are 31/32 inch long.

q. Carefully slide servo toward manifold and connect self-sealing couplings between servo and manifold.

r. Attach servo to manifold and to baseplate with bolts and washers (three bolts required). **TORQUE BOLTS TO 176 - 194 INCH-POUNDS.** Lockwire bolts, Item 199, Appendix D. Apply slippage mark.

s. Apply a bead of sealing compound, Item 312, Appendix D, around each bolthead and check that there is a bead of sealing compound showing between the feet and deck.

t. Position pitch/trim assembly arm in clevis of mixer link.

u. Install self-retaining bolt and washers (under head) (PARA 11-1).

v. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155 (Figure 11-61, Detail B).

w. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

x. Install short bushings in slot each side link. Install bolt (1-17/32 inch long), washers, and nut in slot of mixer link and servo arm. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88 (Figure 11-61, Detail B).

y. Install bushing in rear hole of link and slot of servo arm. Install bolt (1-9/32 inch long), washer, and nut through spacer. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88 (Figure 11-61, Detail B).

z. Place adjustable rod end clevis of input rod on pitch/trim assembly lever arm and place other end on torque shaft lever. Install input control rod (PARA 11-27).

aa. Slowly move cyclic stick to front or rear until input rod lines up with holes in torque shaft lever. Install input rod (PARA 11-27).

ab. Connect electrical connector P464R to pitch/trim actuator and electrical connector P460R to SAS module. Lockwire, Item, 198, Appendix D, connectors.

ac. Do a rigging check (PARA 11-2).

11-11.1 REPLACE PITCH/TRIM ASSEMBLY 11-11.1

NOTE

- Rigging check need not be done, if old input rod is measured from center of bolthole to center of bolthole and new input rod is adjusted to that dimension.
- Rigging check need not be done, if same servo was reinstalled and length of input rod was not changed.

ad. Do an operational check of stability augmentation system (TM 11-1520-237-23-2).

ae. Do an operational check of No. 2 hydraulic system (TM 55-1520-237-T).

af. Check area for cleanness and foreign material.

ag. Close main rotor pylon sliding cover.

ah. Do a maintenance test flight (TM 55-1520-237-MTF).

11-11.2 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING 11-11.2

REMOVE

a. Remove SAS actuator bleed screw. Remove and discard bleed screw packing.

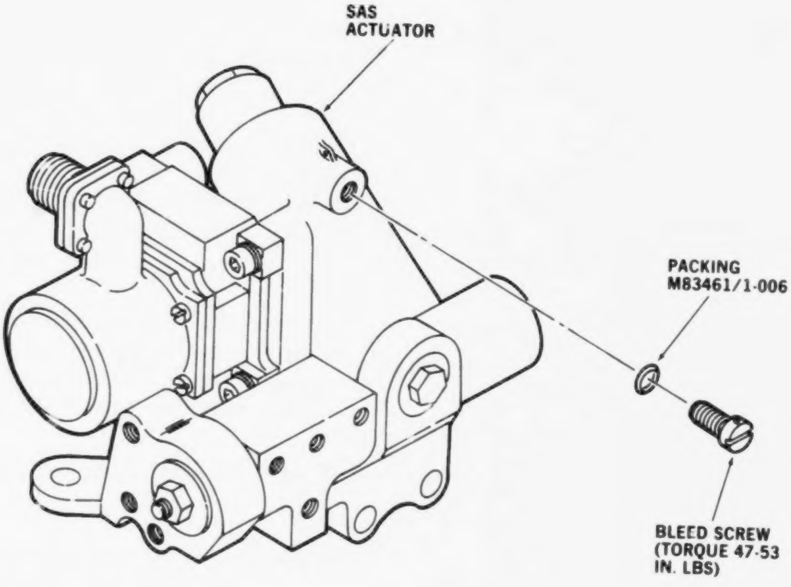
b. Clean screw with alcohol Item 72, Appendix D. Blow out screw bleed port with dry, filtered, compressed air.

INSTALL

c. Coat new packing, M83461/1-006 and screw threads with hydraulic fluid, Item 174, Appendix D.

d. Install packing on screw. Install screw in SAS actuator. **TORQUE SCREW TO 47 - 53 INCH-POUNDS.** Lockwire, Item 198, Appendix D.

e. Check bleed screw installation for leakage (PARA 7-2).


SAS ACTUATOR
PACKING M83461/1-006
BLEED SCREW (TORQUE 47-53 IN. LBS)

S 79847 (C22)

FIGURE 11-62

11-12 PITCH/TRIM ASSEMBLY - REPAIR (AVIM) 11-12

PARAGRAPH BREAKDOWN

11-12.1 REPLACE SAS SERVOVALVE (AVIM)

11-12.2 REPLACE SAS ACTUATOR (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68H - Aircraft Pneudraulic Repairer

MATERIALS/PARTS

- Cotter Pin, MS24665-153
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 198, Appendix D
- Packing, M83461/1-010
- Packing, M83461/1-013
- Seals, CEC 4981-011

TOOLS

- Hydraulic Repairer's Toolkit, SC 5180-99-CL-A03
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 11-1
- PARA 11-10
- TM 55-1520-237-T

11-12.1 REPLACE SAS SERVOVALVE (AVIM) 11-12.1

Refer to PARA 11-10 for SAS servovalve replacement.

11-12.2 REPLACE SAS ACTUATOR (AVIM)

CAUTION

To keep dirt out of components, make sure pitch/trim assembly is clean before disassembly. Replace SAS actuator only in a clean place. Have replacement actuator ready for installation before old actuator is removed.

REMOVE

a. Unbolt SAS actuator output clevis from link.

b. Unbolt SAS actuator from pitch/trim assembly. Carefully lift actuator straight up and remove transfer tubes. Remove seals from transfer tubes.

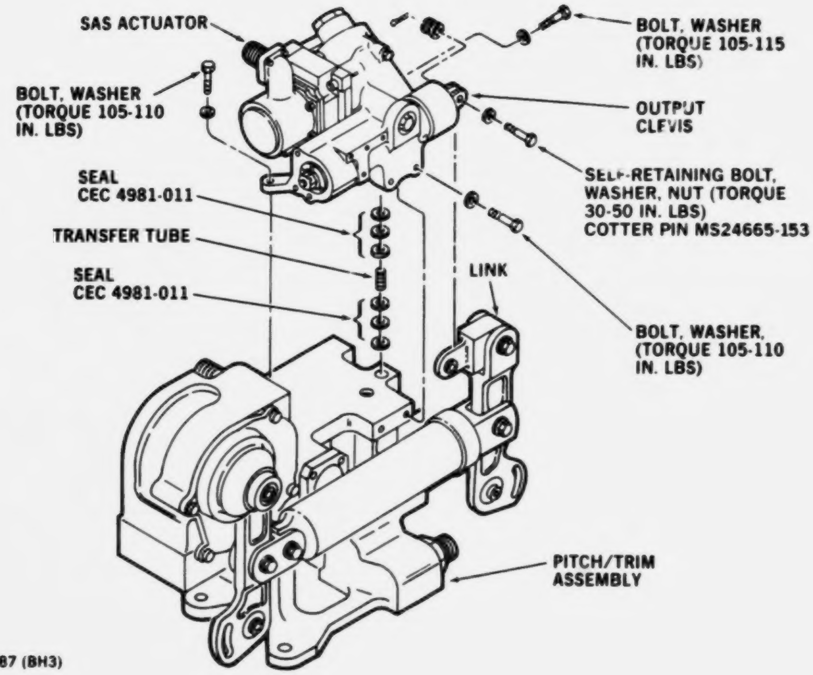

SAS ACTUATOR
BOLT, WASHER (TORQUE 105-115 IN. LBS)
BOLT, WASHER (TORQUE 105-110 IN. LBS)
OUTPUT CLEVIS
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SEAL CEC 4981-011
TRANSFER TUBE
SEAL CEC 4981-011
LINK
BOLT, WASHER, (TORQUE 105-110 IN. LBS)
PITCH/TRIM ASSEMBLY
S 45587 (BH3)

FIGURE 11-63

11-12.2 REPLACE SAS ACTUATOR (AVIM) 11-12.2

INSTALL

c. Coat new seals with hydraulic fluid, Item 174, Appendix D, before installing.

d. Install new seals, CEC 4981-011, on both transfer tubes. Install transfer tubes in pitch/trim assembly.

e. Carefully install replacement actuator on pitch/trim assembly, making sure transfer tubes line up with holes in actuator. Install bolts and washers.

f. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.** Lockwire, Item 198, Appendix D, bolts.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

g. Install SAS actuator output clevis to link.

h. Install self-retaining bolt and washers (under head) (PARA 11-1).

i. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

j. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

k. Do an operational check of pitch/trim assembly (TM 55-1520-237-T).

11-13 COLLECTIVE BOOST SERVO 11-13

PARAGRAPH BREAKDOWN

11-13.1 REPLACE COLLECTIVE BOOST SERVO

11-13.2 REPLACE PRESSURE SWITCH AND THERMAL RELIEF VALVE

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 2, Appendix D
- Alcohol, Item 72, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-155
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, M83461/1-011
- Packing, MS28778-6
- Rags
- Lead Seal, 81264
- Sealing Compound, Item 312, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- PARA 11-2
- PARA 11-27
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-13.1 REPLACE COLLECTIVE BOOST SERVO 11-13.1

REMOVE

a. Open main rotor pylon sliding cover.

b. If main rotor blades are installed, turn main rotor head to allow overhead clearance and make it easier to remove collective boost servo.

c. Turn off all electrical and hydraulic power.

CAUTION

Do not store self-retaining bolts in bearings.

d. Unbolt and remove input control rod and bushings from torque shaft.

e. Unbolt and remove input control rod and bushings from boost servo lever.

f. Unbolt and remove front end of output control rod and bushings at boost servo.

g. Disconnect electrical connector from pressure switch in front of boost servo.

h. Unbolt boost servo from baseplate and manifold.

CAUTION

Do not drop boost servo when removing, or internal damage will result.

i. Carefully pull boost servo forward to separate servo self-sealing couplings from manifold.

j. Cover boost servo and manifold to keep dirt from hydraulic system.

INSPECT

k. Visually inspect both input and output power piston shafts for cracks or evidence of separation of shaft from clevis end. **NO CRACKS OR SEPARATION ALLOWED.**

l. Visually inspect cylinder for evidence of cracks. **NO CRACKS OR SEPARATION ALLOWED.**

m. Replace collective boost servo if cracks or separation is found.

n. Check all servo pin-rivet connections (Figure 11-64, Detail E) as follows:

(1) Pin-rivets attaching redundant link to input arm, and output lever shall not rotate in link assembly. Axial motion of pin rivet assemblies is not allowed. **REPLACE SERVOS NOT WITHIN LIMITS. NO REPAIR ALLOWED.**

(2) Pin-rivets in upper connection of input arm may or may not rotate in arm assembly.

(3) Pin-rivets in upper connection of output lever may or may not rotate in lever assembly.

(4) Bushings and collars shall not rotate or move axially with respect to pin-rivets on any of the servo connections. **REPLACE SERVOS NOT WITHIN LIMITS. NO REPAIR ALLOWED.**

(5) Check axial play of upper bushings and pin-rivet connections. If combined feeler gage readings between pinned parts exceeds 0.020 inch on any connection point, **REPLACE SERVO. NO REPAIR ALLOWED.**

11-13.1 REPLACE COLLECTIVE BOOST SERVO 11-13.1

INSTALL

o. Turn off all electrical and hydraulic power.

CAUTION

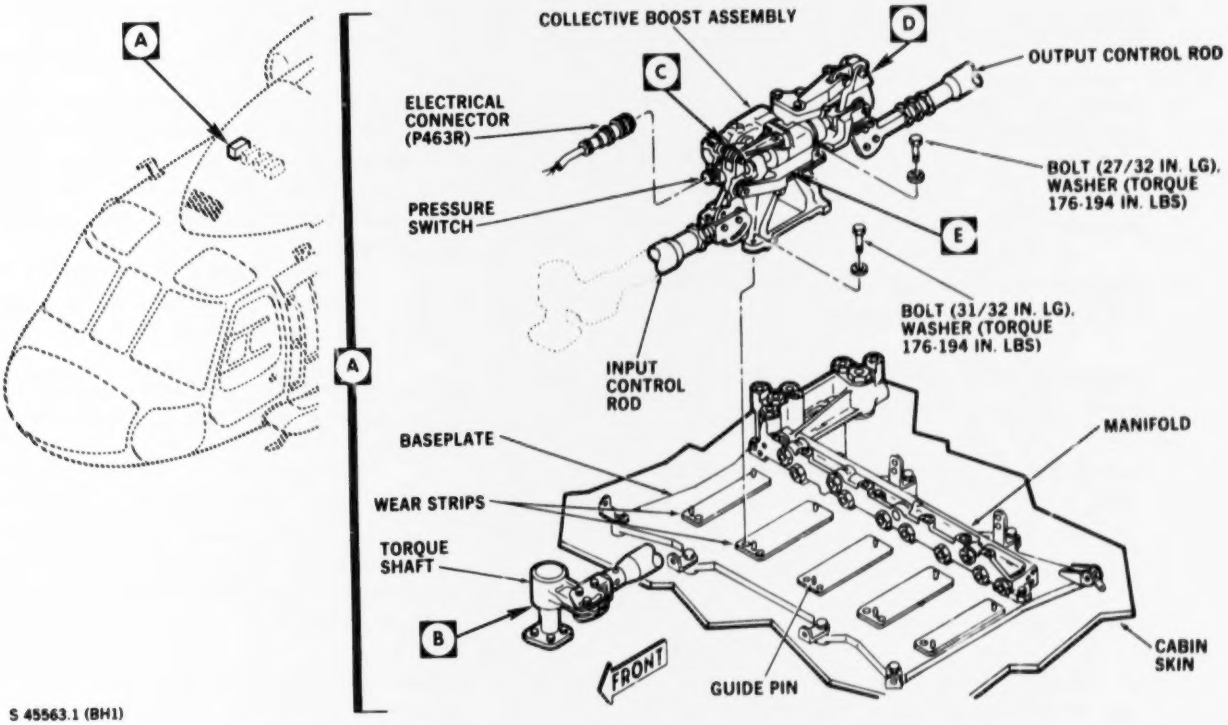
Do not drop boost servo when installing, or internal damage will result.

p. Remove cover from replacement collective boost servo and from manifold.

q. Make sure manifold and servo self-sealing couplings are clean. If needed, wipe clean with clean rags and flush with alcohol, Item 72, Appendix D.

r. Remove old sealing compound from mounting holes and deck area using a plastic scraper.

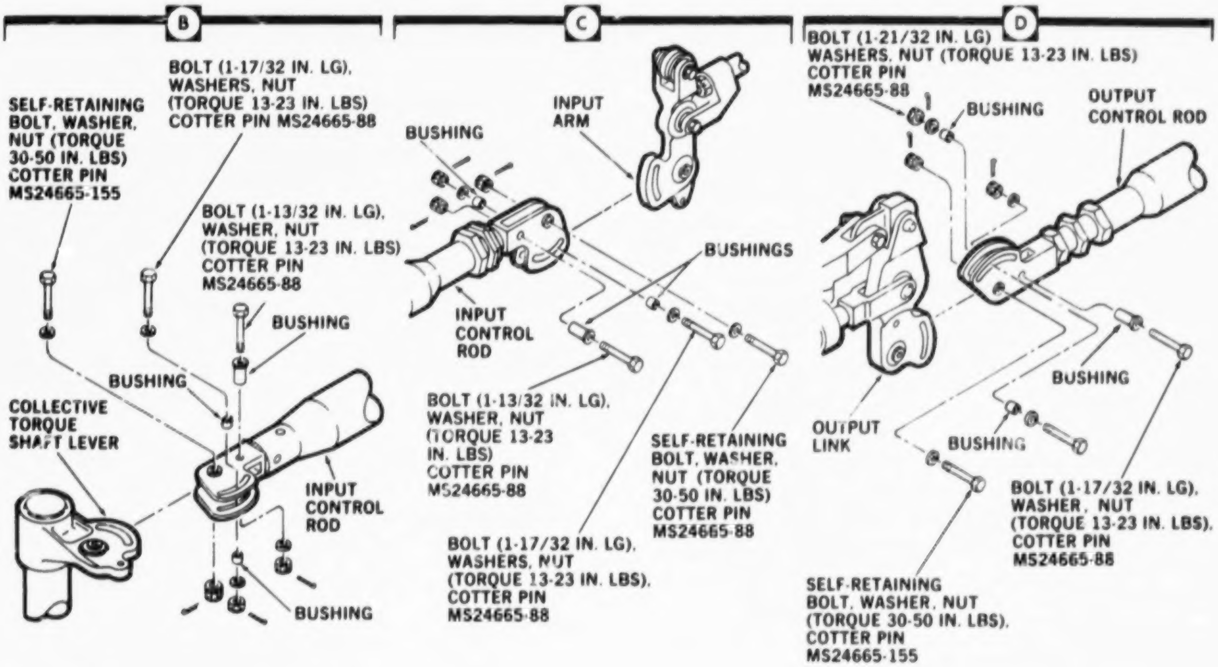
s. Remove paint from bottom of servo feet using 100-grit abrasive cloth, Item 2, Appendix D.


A
A
COLLECTIVE BOOST ASSEMBLY
D
C
OUTPUT CONTROL ROD
ELECTRICAL CONNECTOR (P463R)
BOLT (27/32 IN. LG), WASHER (TORQUE 176-194 IN. LBS)
PRESSURE SWITCH
E
BOLT (31/32 IN. LG), WASHER (TORQUE 176-194 IN. LBS)
INPUT CONTROL ROD
BASEPLATE
MANIFOLD
WEAR STRIPS
TORQUE SHAFT
B
FRONT
GUIDE PIN
CABIN SKIN

S 45563.1 (BH1)

FIGURE 11-64 (SHEET 1 OF 3)

11-13.1 REPLACE COLLECTIVE BOOST SERVO 11-13.1


B
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-17/32 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BOLT (1-13/32 IN. LG), WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BUSHING
BUSHING
COLLECTIVE TORQUE SHAFT LEVER
INPUT CONTROL ROD
BUSHING
C
BUSHING
INPUT ARM
BUSHINGS
INPUT CONTROL ROD
BOLT (1-13/32 IN. LG), WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-88
BOLT (1-17/32 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS), COTTER PIN MS24665-88
D
BOLT (1-21/32 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BUSHING
OUTPUT CONTROL ROD
OUTPUT LINK
BUSHING
BUSHING
BOLT (1-17/32 IN. LG), WASHER, NUT (TORQUE 13-23 IN. LBS), COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS), COTTER PIN MS24665-155

S 45563.2 (BH1)

FIGURE 11-64 (SHEET 2 OF 3)

t. Thoroughly wipe deck mounting area and servo feet with clean rags and alcohol, Item 72, Appendix D. Final wiping must be in one direction only, and followed by a repeat wipe with a clean, unused rag.

u. Position servo feet up. Apply a continuous bead of sealing compound, Item 312, Appendix D, in a D-shaped pattern around the bottom edge of each foot. **DO NOT COVER ENTIRE FOOT.**

v. Position servo over mounting holes as close to manifold couplings as possible.

w. Carefully slide servo toward manifold and connect self-sealing couplings between servo and manifold.

x. Line up output control rod clevis with boost servo arm while sliding servo toward manifold.

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of bolts are critical characteristics.

NOTE

Front and rear bolts are different lengths. Bolts attaching to manifold are 27/32 inch long. Bolts attaching to baseplate are 31/32 inch long.

y. Attach boost servo to manifold and baseplate with bolts and washers. **TORQUE BOLTS TO 176 - 194 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts. Apply slippage mark.

11-13.1 REPLACE COLLECTIVE BOOST SERVO 11-13.1

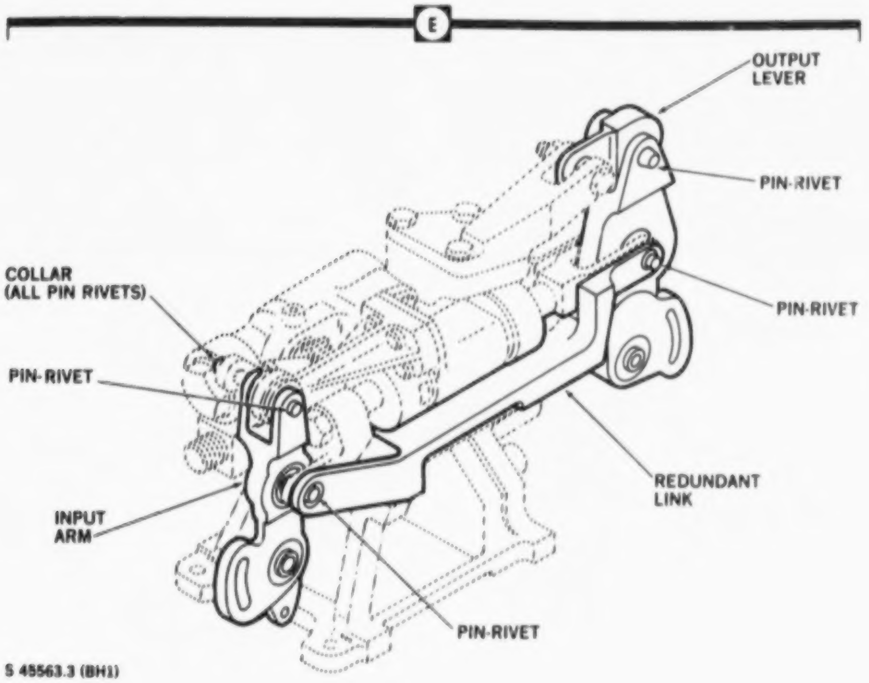

E
OUTPUT LEVER
PIN-RIVET
PIN-RIVET
COLLAR (ALL PIN RIVETS)
PIN-RIVET
REDUNDANT LINK
INPUT ARM
PIN-RIVET
S 45563.3 (BH1)

FIGURE 11-64 (SHEET 3 OF 3)

z. Apply a bead of sealing compound, Item 312, Appendix D, around each bolthead and check that a bead of sealing compound is showing between servo feet and deck.

aa. Position servo arm in clevis of output rod. Install output control rod (PARA 11-27).

ab. Install input control rod (PARA 11-27).

ac. Connect electrical connector to pressure switch on front of boost servo.

ad. Do a rigging check (PARA 11-2).

ae. Do an operational check of No. 2 hydraulic system (TM 55-1520-237-T).

af. Be sure area is clean and free of foreign objects before closing cover.

ag. Close main rotor pylon sliding cover.

ah. Do a maintenance test flight (TM 55-1520-237-MTF).

11-13.2 REPLACE PRESSURE SWITCH AND THERMAL RELIEF VALVE 11-13.2

CAUTION

To avoid getting dirt in components, make sure collective boost servo is clean before disassembly. Have replacement switch or valve ready for installation before old switch or valve is removed.

REMOVE

a. Using wrench flats, unscrew pressure switch from servo.

b. Remove packings from pressure switch.

c. Unscrew thermal relief valve from servo.

d. Remove packing from valve.

NOTE

Before installing pressure switch and relief valve, coat packings and threads with hydraulic fluid, Item 174, Appendix D.

INSTALL

e. Install packing, M83461/1-011, on new thermal relief valve and screw valve in servo. **TORQUE VALVE TO 25 - 30 INCH-POUNDS.** Lockwire, Item 199, Appendix D. Install lead seal on lockwire.

f. Install packings, M83461/1-011 and MS28778-6 on pressure switch. Using wrench flats, screw switch into servo. **TORQUE PRESSURE SWITCH TO 142 - 157 INCH-POUNDS.** Lockwire, Item 199, Appendix D. Install lead seal on lockwire.

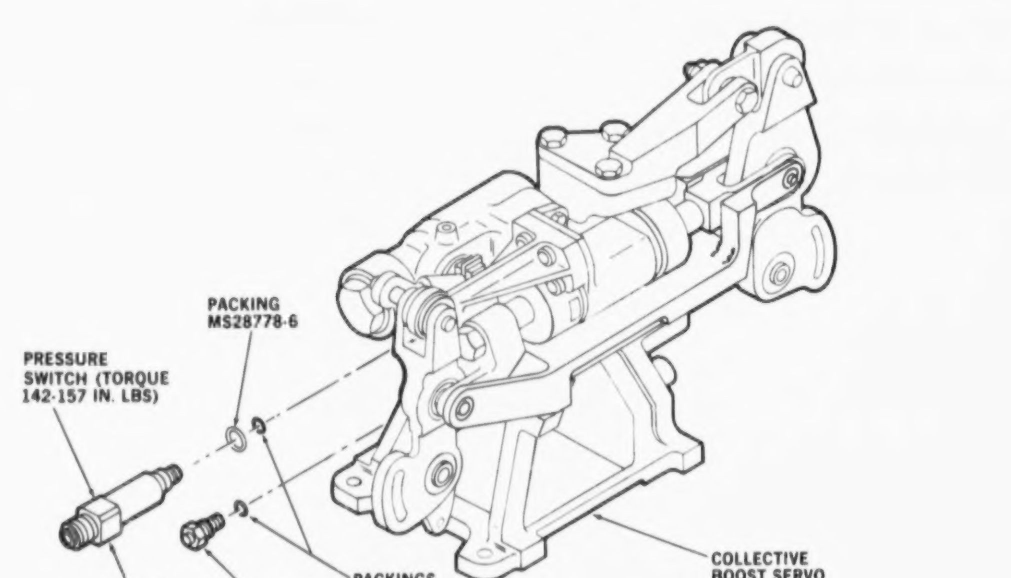

PACKING MS28778-6
PRESSURE SWITCH (TORQUE 142-157 IN. LBS)
WRENCH FLATS
PACKINGS M83461/1-011
THERMAL RELIEF VALVE
COLLECTIVE BOOST SERVO
S 45550 (C8)

FIGURE 11-65

11-14 ROLL ACTUATOR 11-14

PARAGRAPH BREAKDOWN

11-14.1 REPLACE ROLL ACTUATOR

11-14.2 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 2, Appendix D
- Alcohol, Item 72, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-155
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, M83461/1-006
- Rags
- Sealing Compound, Item 312, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686

REFERENCES

- PARA 7-2
- PARA 11-27
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-14.1 REPLACE ROLL ACTUATOR 11-14.1

NOTE

If SAS actuator and SAS servovalve are to be removed, send roll actuator to intermediate level maintenance.

REMOVE

a. Open main rotor pylon sliding cover.

b. If main rotor blades are installed, turn main rotor head to allow overhead clearance and make it easier to remove roll actuator.

c. Turn off all electrical and hydraulic power.

d. Disconnect electrical connector from SAS servo.

CAUTION

Do not store self-retaining bolts in rod end bearings.

e. Remove lateral input control rod (PARA 11-27).

f. Disconnect lateral control rod from rear roll actuator lever (PARA 11-27).

g. Unbolt roll actuator from baseplate (two bolts) and from manifold (one bolt).

CAUTION

Do not drop servo when removing, or internal damage will result.

h. Carefully pull roll actuator forward to separate self-sealing couplings from manifold (Figure 11-67, Detail A).

i. Cover roll actuator and manifold to keep dirt from hydraulic system.

11-14.2 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING 11-14.2

REMOVE

a. Remove SAS actuator bleed screw (Figure 11-66). Remove and discard bleed screw packing.

b. Clean screw with alcohol, Item 72, Appendix D. Blow out screw bleed port with dry, filtered, compressed air.

INSTALL

c. Coat new packing, M83461/1-006 and screw threads with hydraulic fluid, Item 174, Appendix D.

d. Install packing on screw. Install screw in SAS actuator. **TORQUE SCREW TO 47 - 53 INCH-POUNDS.** Lockwire, Item 198, Appendix D.

e. Check bleed screw installation for leakage (PARA 7-2).

INSTALL

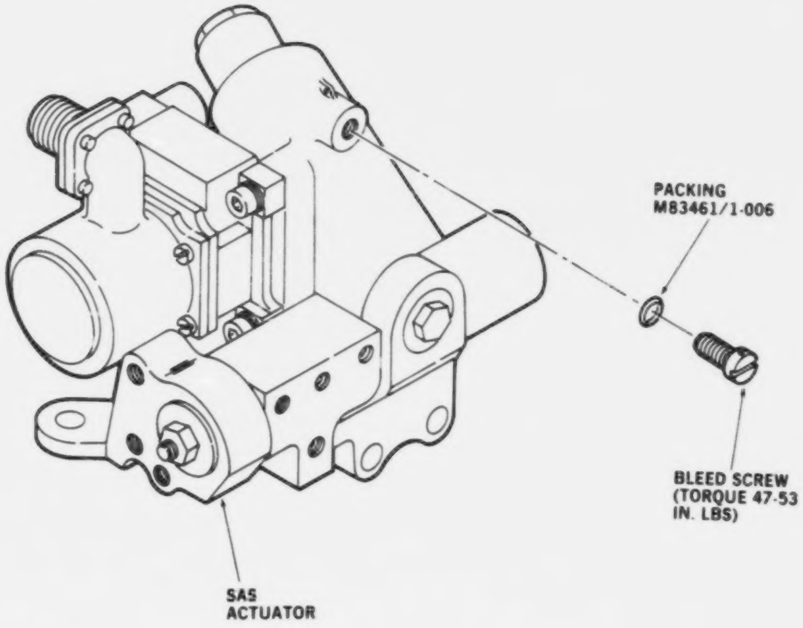
f. Turn off all electrical and hydraulic power.

CAUTION

Do not drop servo when installing, or internal damage will result.

g. Remove cover from replacement roll servo and from manifold.

h. Make sure manifold and roll actuator self-sealing couplings are clean. If needed, wipe with clean rags and flush with alcohol, Item 72, Appendix D.



S 79848 (C22)

FIGURE 11-66

11-14.2 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING 11-14.2

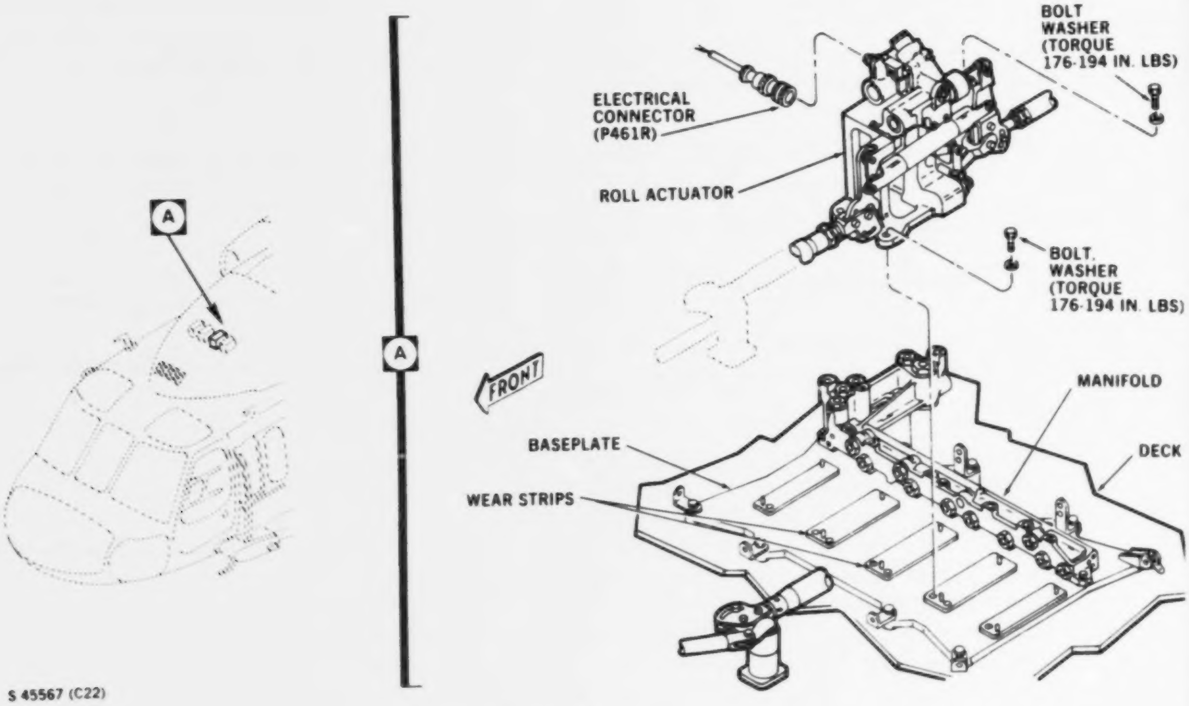

A
A
BOLT
WASHER
(TORQUE
176-194 IN. LBS)
ELECTRICAL
CONNECTOR
(P461R)
ROLL ACTUATOR
BOLT,
WASHER
(TORQUE
176-194 IN. LBS)
FRONT
MANIFOLD
BASEPLATE
DECK
WEAR STRIPS
S 45567 (C22)

FIGURE 11-67

i. Remove old sealing compound from mounting holes and deck area using a nonmetallic scraper.

j. Remove paint from bottom of servo feet using abrasive cloth, Item 2, Appendix D.

k. Thoroughly wipe deck mounting area and servo feet with clean rags and alcohol, Item 72, Appendix D. Final wiping must be in one direction only, and followed by a repeat wipe with a clean, unused rag.

l. Position servo feet up. Apply a continuous bead of sealing compound, Item 312, Appendix D, in a D-shaped pattern around the bottom edge of each foot. **DO NOT COVER ENTIRE FOOT.**

m. Position servo over mounting holes as close to manifold couplings as possible.

n. Carefully slide servo toward manifold and connect self-sealing couplings between servo and manifold.

o. Attach roll actuator to manifold and to deck with bolts and washers.

11-14.2 REPLACE SAS ACTUATOR BLEED SCREW AND PACKING 11-14.2

NOTE

Bolt attached to manifold is 27/32 inch long. Bolts attached to baseplate are 31/32 inch long.

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of bolts are critical characteristics.

p. **TORQUE BOLTS TO 176 - 194 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts. Apply slippage mark.

q. Apply a bead of sealing compound, Item 312, Appendix D, around each bolthead and check that there is a bead of sealing compound showing between the feet and deck.

r. Install lateral input control rod (PARA 11-27).

s. Install lateral control rod on rear roll actuator lever (PARA 11-27).

t. Install lateral input control rod on front roll actuator lever and lateral torque shaft (PARA 11-27).

u. Connect electrical connector to SAS servo. Lockwire, Item 198, Appendix D.

v. Do an operational check of the No. 2 hydraulic system (TM 55-1520-237-T).

w. Make sure area is clean and free of foreign objects before closing cover.

x. Close main rotor pylon sliding cover.

y. Do a maintenance test flight (TM 55-1520-237-MTF).

11-15 ROLL ACTUATOR - REPAIR (AVIM) 11-15

PARAGRAPH BREAKDOWN

11-15.1 REPLACE SAS SERVOVALVE (AVIM)

11-15.2 REPLACE SAS ACTUATOR (AVIM)

11-15.3 REPLACE ROLL ACTUATOR LINKS AND LEVERS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68H - Aircraft Pneudraulic Repairer

MATERIALS/PARTS

- Cotter Pin, MS24665-151
- Cotter Pin, MS24665-153
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 196, Appendix D
- Packing, M83461/1-010
- Packing, M83461/1-013
- Seal, CEC 4981-011

TOOLS

- Hydraulic Repairer's Toolkit, SC 5180-99-CL-A03
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 0 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 11-1
- PARA 11-10
- TM 55-1520-237-T

11-15.1 REPLACE SAS SERVOVALVE (AVIM) 11-15.1

Refer to PARA 11-10 for SAS servovalve replacement.

11-15.2 REPLACE SAS ACTUATOR (AVIM)

CAUTION

To keep dirt out of components, make sure roll servo is clean before disassembly. Replace SAS actuator only in a clean place. Have replacement actuator ready for installation before old actuator is removed.

REMOVE

a. Unbolt SAS actuator output clevis from link.

b. Unbolt SAS actuator from roll actuator housing. Carefully lift actuator straight up and remove transfer tubes. Remove seals from transfer tubes.

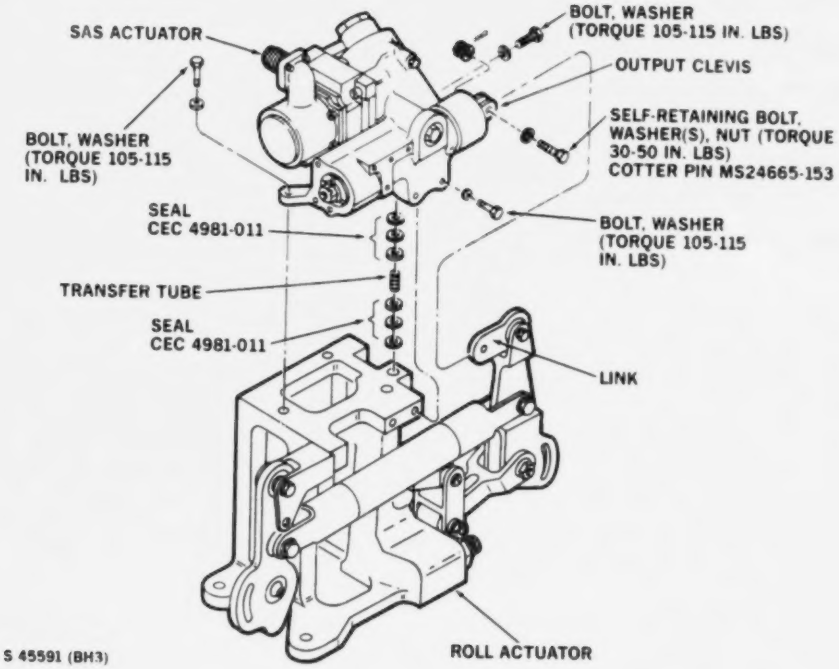

SAS ACTUATOR
BOLT, WASHER (TORQUE 105-115 IN. LBS)
OUTPUT CLEVIS
BOLT, WASHER (TORQUE 105-115 IN. LBS)
SELF-RETAINING BOLT, WASHER(S), NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SEAL CEC 4981-011
BOLT, WASHER (TORQUE 105-115 IN. LBS)
TRANSFER TUBE
SEAL CEC 4981-011
LINK
S 45591 (BH3)
ROLL ACTUATOR

FIGURE 11-68

11-15.2 REPLACE SAS ACTUATOR (AVIM) 11-15.2

INSTALL

c. Coat seals with hydraulic fluid, Item 174, Appendix D, before installing.

d. Install seals, CEC 4981-011, on both transfer tubes. Install transfer tubes in roll servo housing.

e. Carefully install replacement actuator on roll actuator housing, making sure transfer tubes line up with holes in actuator. Install bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.** Lockwire, Item 198, Appendix D, bolts.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

f. Install SAS actuator output clevis to link.

g. Install self-retaining bolt and washers (under head) (PARA 11-1).

h. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

i. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

j. Do an operational check of roll actuator (TM 55-1520-237-T).

11-15.3 REPLACE ROLL ACTUATOR LINKS AND LEVERS (AVIM) 11-15.3

REMOVE

a. Unbolt rod end from output lever, and remove bushing and rod end.

b. Unbolt output lever from pushrod and scissor link. Remove output lever.

c. Unbolt scissor link from vertical link. Remove bushing and scissor link.

d. Unbolt vertical link from housing. Remove pin. Remove vertical link.

e. Unbolt output lever from pushrod and support. Remove output lever and pushrod.

f. Unbolt support from housing. Remove support.

INSPECT

g. Inspect bearing in rod end. **RADIAL PLAY MUST BE LESS THAN 0.005 INCH.** Replace rod end if bearing has too much play.

h. Inspect bearing in output lever. **RADIAL PLAY MUST BE LESS THAN 0.005 INCH.** Replace output lever if bearing has too much play.

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

i. Install replacement rod end between actuator output clevis (if actuator is installed) and output lever. Install bushing in output lever.

j. Install self-retaining bolt and washers (under head) (PARA 11-1)

k. Install nut on bolt. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

l. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

m. Install replacement scissors link and push rod on output lever.

n. Install self-retaining bolt and washers (under head) (PARA 11-1).

o. Install nut on bolt. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

p. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS** Apply slippage mark.

11-15.3 REPLACE ROLL ACTUATOR LINKS AND LEVERS (AVIM) 11-15.3

q. Install lower end of vertical link on scissor link. Line up holes and install bushing.

r. Install self-retaining bolt and washers (under head) (PARA 11-1)

s. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

t. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

u. Install vertical link on actuator housing. Line up holes and install pin, (shims as required to maintain .002 to .016 end play 2 places, equally spaced about housing), bolt, washer, and nut, (washer under nut). **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-151.

v. Install support on actuator housing with bolt and washer (under head). **TORQUE BOLT TO 45 - 50 INCH-POUNDS.**

w. Install input lever on support. Line upper holes of input lever with upper holes of support.

x. Install self-retaining bolt and washers (under head) (PARA 11-1).

y. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin MS24665-153.

z. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aa. Install pushrod on center hold of input lever. Line up holes.

ab. Install self-retaining bolt and washers (under head) (PARA 11-1).

ac. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ad. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ae. Do operational check of roll actuator (TM 55-1520-237-T).

11-15.3 REPLACE ROLL ACTUATOR LINKS AND LEVERS (AVIM) 11-15.3

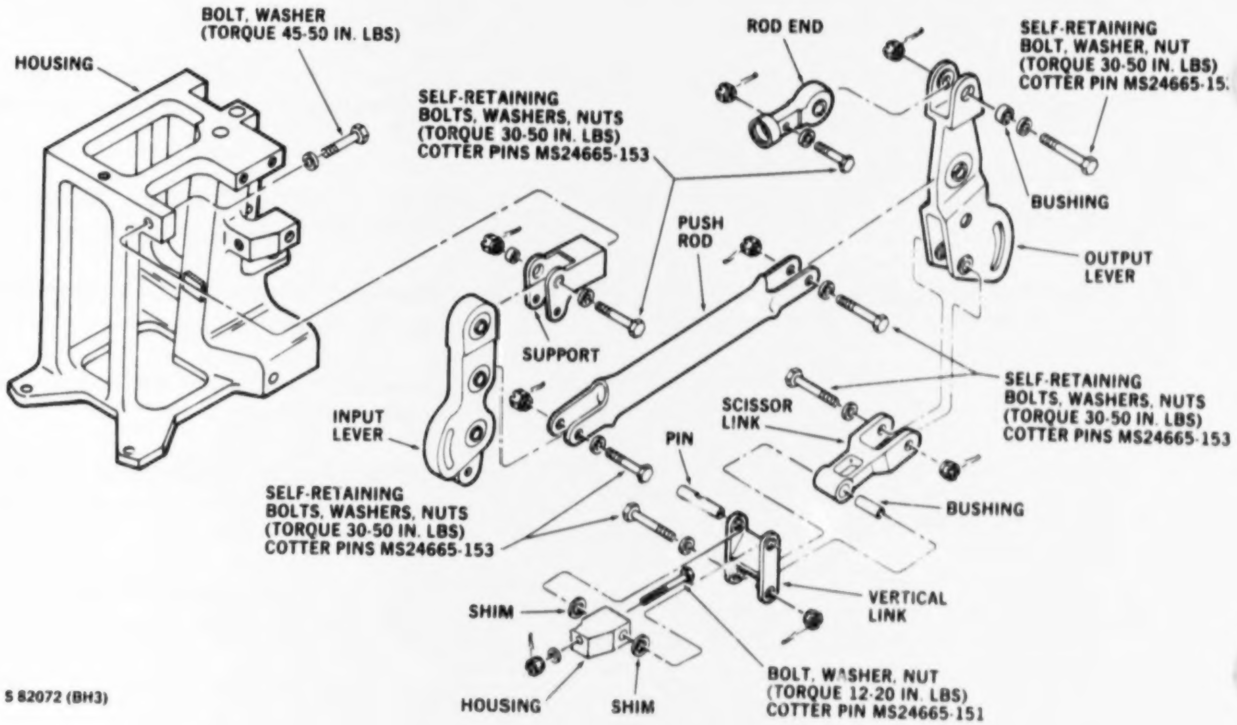

BOLT, WASHER
(TORQUE 45-50 IN. LBS)
HOUSING
ROD END
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN MS24665-15
SELF-RETAINING
BOLTS, WASHERS, NUTS
(TORQUE 30-50 IN. LBS)
COTTER PINS MS24665-153
BUSHING
PUSH
ROD
OUTPUT
LEVER
SUPPORT
SELF-RETAINING
BOLTS, WASHERS, NUTS
(TORQUE 30-50 IN. LBS)
COTTER PINS MS24665-153
SCISSOR
LINK
INPUT
LEVER
PIN
SELF-RETAINING
BOLTS, WASHERS, NUTS
(TORQUE 30-50 IN. LBS)
COTTER PINS MS24665-153
BUSHING
VERTICAL
LINK
SHIM
S 82072 (BH3)
HOUSING
SHIM
BOLT, WASHER, NUT
(TORQUE 12-20 IN. LBS)
COTTER PIN MS24665-151

FIGURE 11-69

11-16 PILOT-ASSIST SERVO MODULE - REPAIR (AVIM) 11-16

PARAGRAPH BREAKDOWN

11-16.1 REPLACE THREE-WAY VALVES (AVIM)
11-16.2 REPLACE PRESSURE REDUCER (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68H - Aircraft Pneudraulic Repairer

MATERIALS/PARTS

- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 198, Appendix D
- Packing, M83461/1-114
- Packing, M83461/1-116
- Packing, M83461/1-119
- Packing, M83461/1-120
- Packing, M83461/1-121
- Packing, M83461/1-215
- Seal, CEC 4981-213
- Seal, CEC 4981-214
- Seal, CEC 4981-114
- Tape, Item 347, Appendix D

TOOLS

- Hydraulic Repairer's Toolkit, SC 5180-99-CL-A03
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- TM 55-1520-237-T

11-16.1 REPLACE THREE-WAY VALVES 11-16.1

CAUTION

To keep dirt from module, make sure pilot assist servo module is clean before disassembly. Replace three-way valves only in a clean place. Have replacement valve ready for installation before old valve is removed.

REPLACE

a. Remove screws and three-way valve (boost shutoff, trim shutoff, or SAS shutoff, as necessary) from pilot assist servo module.

b. Remove packings from trim shutoff valve, or packings and seals from SAS or boost shutoff valves.

c. Coat packings and seals with hydraulic fluid, Item 174, Appendix D, before installing.

d. If trim shutoff valve is being replaced, install new packings, M83461/1-119, M83461/1-120, and M83461/1-121 on valve. If boost or SAS shutoff valves are being replaced, install new packings, M83461/1-215, and new seals, CEC 4981-213 and CEC 4981-214, on valve.

e. Install valve in module. Install screws. **TORQUE SCREWS TO 19 - 21 INCH-POUNDS.** Lockwire screws, Item, 198, Appendix D.

f. Do an operational check of pilot assist servo module (TM 55-1520-237-T).

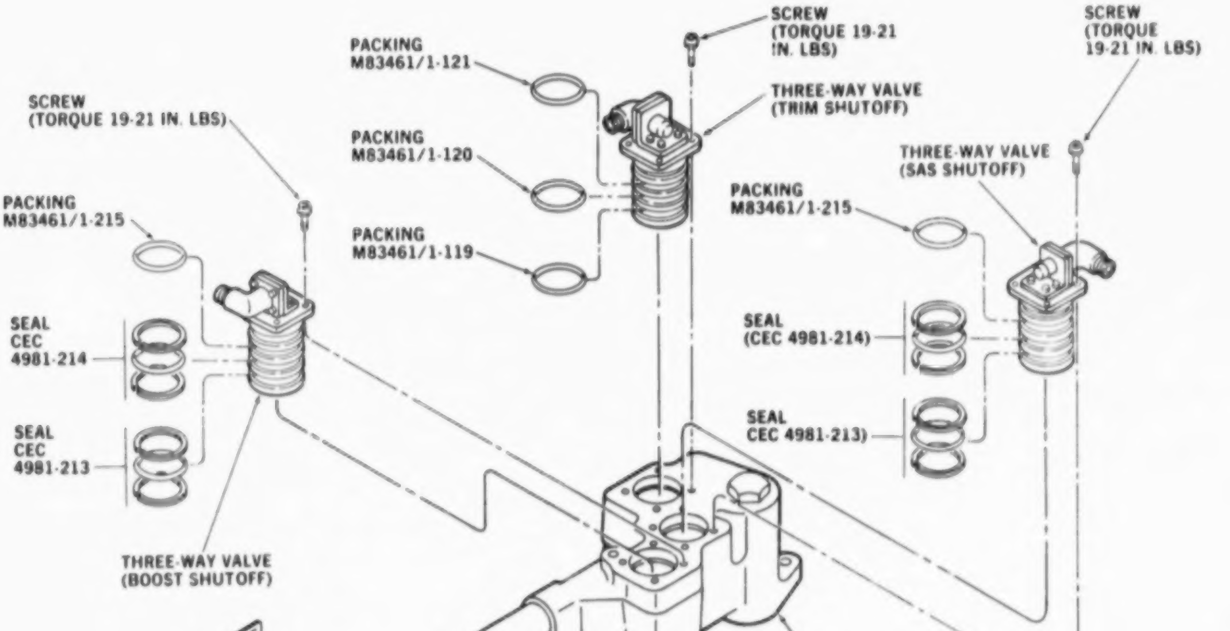

SCREW (TORQUE 19-21 IN. LBS)
PACKING M83461/1-121
SCREW (TORQUE 19-21 IN. LBS)
SCREW (TORQUE 19-21 IN. LBS)
THREE-WAY VALVE (TRIM SHUTOFF)
PACKING M83461/1-120
THREE-WAY VALVE (SAS SHUTOFF)
PACKING M83461/1-215
PACKING M83461/1-215
PACKING M83461/1-119
SEAL CEC 4981-214
SEAL (CEC 4981-214)
SEAL CEC 4981-213
SEAL CEC 4981-213)
THREE-WAY VALVE (BOOST SHUTOFF)
FRONT
PILOT-ASSIST SERVO MODULE
S 45594 (B)

FIGURE 11-70

11-16.2 REPLACE PRESSURE REDUCER (AVIM) 11-16.2

CAUTION

To keep dirt from module, make sure pilot assist servo module is clean before disassembly. Replace pressure reducer only in a clean place. Have replacement reducer ready for installation before old reducer is removed.

REPLACE

a. Unscrew pressure reducer from pilot assist module.

b. Coat packings, seal and threads of replacement pressure reducer with hydraulic fluid, Item 174, Appendix D, before installing.

c. Install new packings, M83461/1-116, M83461/1-114, and new seal, CEC 4981-114, on replacement pressure reducer.

d. Screw pressure reducer into pilot-assist module. **TORQUE TO 238 - 262 INCH-POUNDS.** Lockwire, Item 198, Appendix D.

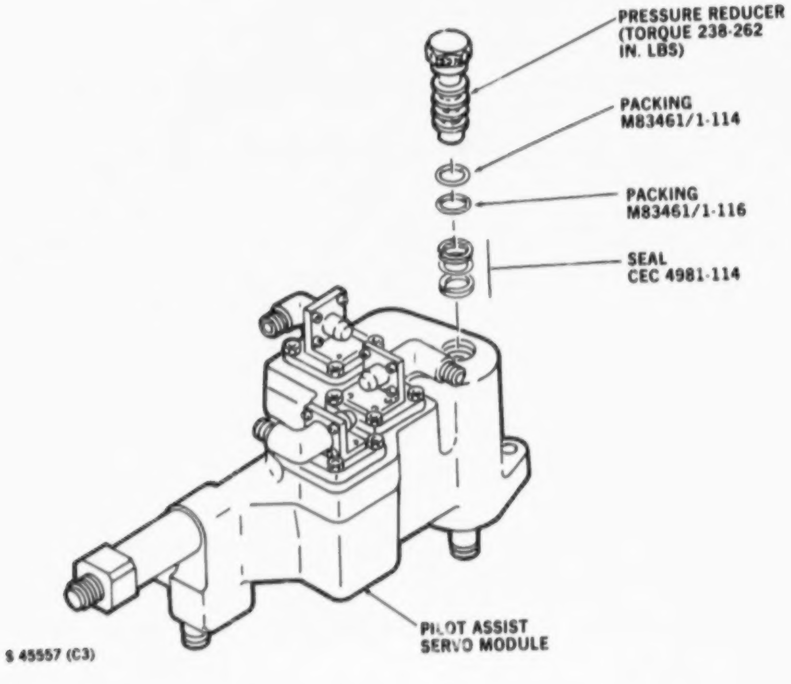

PRESSURE REDUCER (TORQUE 238-262 IN. LBS)
PACKING M83461/1-114
PACKING M83461/1-116
SEAL CEC 4981-114
PILOT ASSIST SERVO MODULE
S 45557 (C3)

FIGURE 11-71

11-17 MIXER - REPLACE 11-17

PARAGRAPH BREAKDOWN

11-17.1	REPLACE MIXER
11-17.2	REPAIR MIXER
11-17.3	REPLACE NO. 3 COLLECTIVE STICK POSITION SENSOR

INITIAL SETUP

PERSONNEL REQUIRED

• One:	MOS 67T	- Tactical Transport Helicopter Repairer
• One:	MOS 68F	- Aircraft Electrician
• One:		- Assistant

MATERIALS/PARTS

- Adhesive, Item 31, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-155
- Crocus Cloth, Item 128, Appendix D
- Dry-Cleaning Solvent, Item 135, Appendix D
- Grease, Item 168, Appendix D
- Lockwire, Item 199, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Sealing Compound, Item 312, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicator, MIL-I-18422
- Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Jumper Lead, SLGNE-1204-1
- Multimeter, Digital, AN/USM-223
- Rigging Kit, 70700-20389-042
- Slide Caliper, GGG-C-105
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 1-6.3
- PARA 2-43
- PARA 4-2
- PARA 4-16
- PARA 11-1
- PARA 11-2
- PARA 11-27
- TM 11-1520-237-23-2
- TM 43-0105
- TM 55-1500-204-25/1
- TM 55-1500-322-24
- TM 55-1520-237-MTF

11-17.1 REPLACE MIXER 11-17.1

REMOVE

a. Remove soundproofing panel from cabin ceiling between stations 281 and 295.

b. Open main rotor pylon sliding cover.

c. If main rotor blades are installed, turn main rotor head to make removal of mixer easier.

d. Remove work platform on top of mixer, (PARA 2-43).

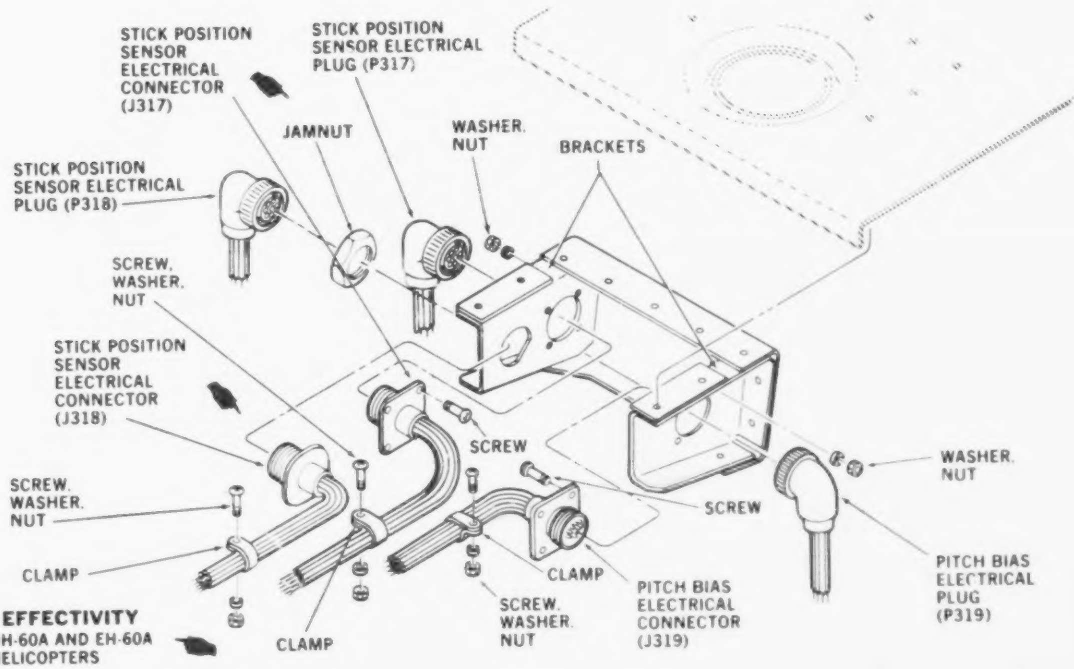
e. Turn off all electrical and hydraulic power.

f. Disconnect electrical connectors at front bracket on mixer (Detail A).

g. Unscrew connectors from brackets.

h. Unclamp electrical wiring from brackets.

i. Install rigging pins in collective, pitch, roll, and yaw torque tubes, pilot assist and primary servos (PARA 11-2).


STICK POSITION SENSOR ELECTRICAL CONNECTOR (J317)
STICK POSITION SENSOR ELECTRICAL PLUG (P317)
JAMNUT
WASHER, NUT
BRACKETS
STICK POSITION SENSOR ELECTRICAL PLUG (P318)
SCREW, WASHER, NUT
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J318)
SCREW
SCREW, WASHER, NUT
CLAMP
CLAMP
SCREW
CLAMP
SCREW, WASHER, NUT
PITCH BIAS ELECTRICAL CONNECTOR (J319)
WASHER, NUT
PITCH BIAS ELECTRICAL PLUG (P319)

EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS

UH60L-150300.1 (B)

FIGURE 11-72 (SHEET 1 OF 2)

11-17.1 REPLACE MIXER 11-17.1

j. Remove or disconnect these flight controls (PARA 11-27).

  (1) Remove forward control rod from mixer arm and forward primary servo.

  (2) Remove lateral and aft control rods from mixer and forward primary servo.

  (3) Remove yaw control rod from yaw servo arm and mixer lever.

  (4) Remove lateral control rod from mixer lever and roll actuator lever.

  (5) Remove collective control rod from servo arm and mixer arm.

  (6) Disconnect yaw pushrod from mixer bellcrank in cabin overhead.

  (7) Disconnect pitch/trim assembly link from mixer lever.

k. Disconnect both collective engine load demand cables from mixer lever (Figure 11-73, Detail A).

l. Unbolt mixer from deck. Keep countersunk washers with bolts.

NOTE

There may be more than one washer under bolthead. Tag each bolt for which leg of mixer it was removed from. Record number of washers under each bolthead.

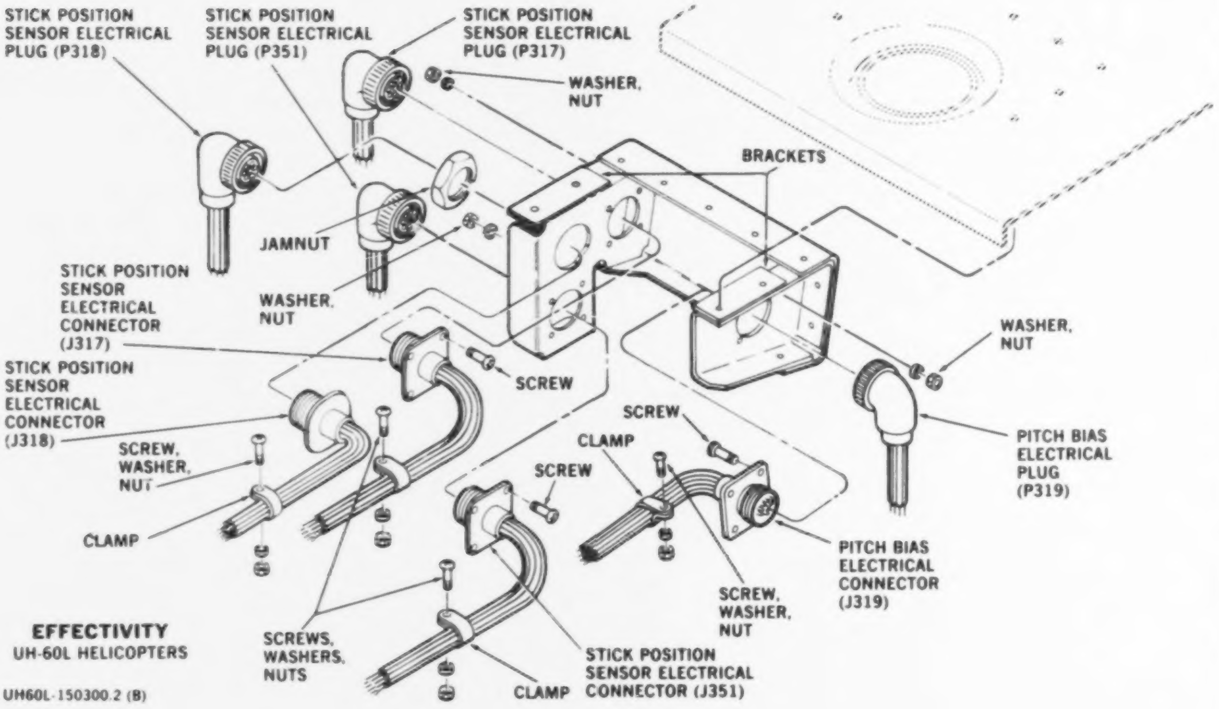

STICK POSITION SENSOR ELECTRICAL PLUG (P318)
STICK POSITION SENSOR ELECTRICAL PLUG (P351)
STICK POSITION SENSOR ELECTRICAL PLUG (P317)
WASHER, NUT
BRACKETS
JAMNUT
WASHER, NUT
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J317)
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J318)
SCREW
WASHER, NUT
SCREW
CLAMP
SCREW, WASHER, NUT
SCREW
CLAMP
PITCH BIAS ELECTRICAL PLUG (P319)
PITCH BIAS ELECTRICAL CONNECTOR (J319)
SCREW, WASHER, NUT
EFFECTIVITY
UH-60L HELICOPTERS
SCREWS, WASHERS, NUTS
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J351)
CLAMP
UH60L-150300.2 (B)

FIGURE 11-72 (SHEET 2 OF 2)

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

m. If shims became unbonded from airframe, do this:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Clean area of unbonded shim(s) using a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D. Remove any remaining adhesive using a nonmetallic scraper.

(2) Mix adhesive, Item 31, Appendix D, in ratio of 100 parts by weight of part A to 22 parts by weight of part B.

(3) Apply a light coat of adhesive to airframe around mounting hole(s). Install shim(s). Wipe extra adhesive from ID of hole in shim(s) using a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

(4) Allow adhesive, Item 31, Appendix D, to cure at 120° ± 10°F (49° ± 5°C) for at least 2 hours.

n. If shim(s) were lost or misplaced, do this:

NOTE

There are two size shims used to install mixer. Use thick shims under front mixer supports, thin shims under rear mixer supports.

(1) Position mixer over mounting holes with correct size replacement shim(s). Install bolts fingertight through mixer supports.

(2) Using feeler gage, measure gap between mixer supports and shims. **MAXIMUM ALLOWABLE GAP BEFORE TORQUING BOLTS IS 0.010 INCH.**

(3) If any gap exceeds 0.010 inch, peel shims as required to allow mixer supports to seat.

(4) Bond replacement shim(s) using procedures in previous paragraphs.

11-17.1 REPLACE MIXER 11-17.1

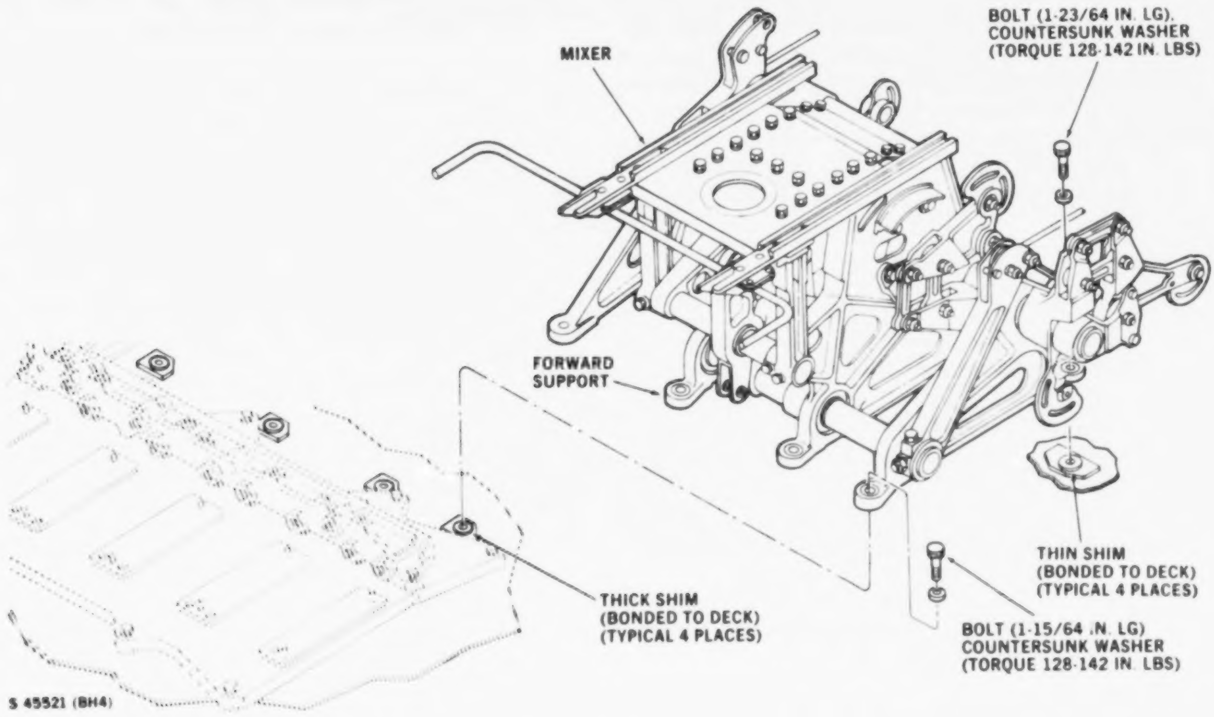

MIXER
BOLT (1-23/64 IN. LG),
COUNTERSUNK WASHER
(TORQUE 128-142 IN. LBS)
FORWARD
SUPPORT
THIN SHIM
(BONDED TO DECK)
(TYPICAL 4 PLACES)
THICK SHIM
(BONDED TO DECK)
(TYPICAL 4 PLACES)
BOLT (1-15/64 IN. LG)
COUNTERSUNK WASHER
(TORQUE 128-142 IN. LBS)
S 45521 (BH4)

FIGURE 11-73

o. Put replacement mixer on deck shims and install eight bolts and washers in same place they were removed from according to tags. Install four long bolts in rear of mixer, and four short bolts in front.

NOTE

Countersunk side of washer goes toward bolthead.

p. Put same number of washers under boltheads as recorded when removed.

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque of bolts are critical characteristics.

q. **TORQUE BOLTS TO 128 - 142 INCH-POUNDS.** Apply slippage mark.

r. Seal areas around boltheads and mating surface of mixer and helicopter with sealing compound, Item 312, Appendix D.

s. In cabin, remove soundproofing panels in ceiling, as necessary, to get to nutplates in mixer supports.

11-17.1 REPLACE MIXER 11-17.1

t. Check that bolt is fully threaded into each nutplate, but does not show more than one thread past nut, to make sure bolt does not contact wiring cables routed under nutplates.

u. If more than one thread is showing past nut, add washers under bolt as necessary or remove washers if bolt does not fully engage nut.

NOTE

There must be at least one washer but no more than three washers under bolthead.

v. Install or connect these flight controls (PARA 11-27):

(1) Connect pitch/trim assembly link to mixer lever.

(2) Connect yaw pushrod to mixer bellcrank in cabin overhead.

(3) Install collective control rod to servo arm and mixer arm.

(4) Install lateral control rod to mixer lever and roll actuator lever.

(5) Install yaw control rod to yaw servo arm and mixer lever.

(6) Install lateral and aft control rods to mixer and primary servo.

(7) Install forward control rod to mixer arm and forward primary servo.

w. Install stick position sensor electrical connector, J318, in forward mounting hole on inside of right bracket on mixing lever, using screws, washers, and nuts.

x. Install stick position sensor electrical connector, J317, in rear mounting hole on inside of right bracket on mixing lever, using screws, washers, and nuts.

y. Install wiring harnesses on brackets using clamps, screws, washers, and nuts.

z. Install stick position sensor electrical, P318 and P317 plugs. Install connectors.

aa. Do a main rotor flight control rigging check (PARA 11-2).

ab. Install work platform on mixer (PARA 2-43).

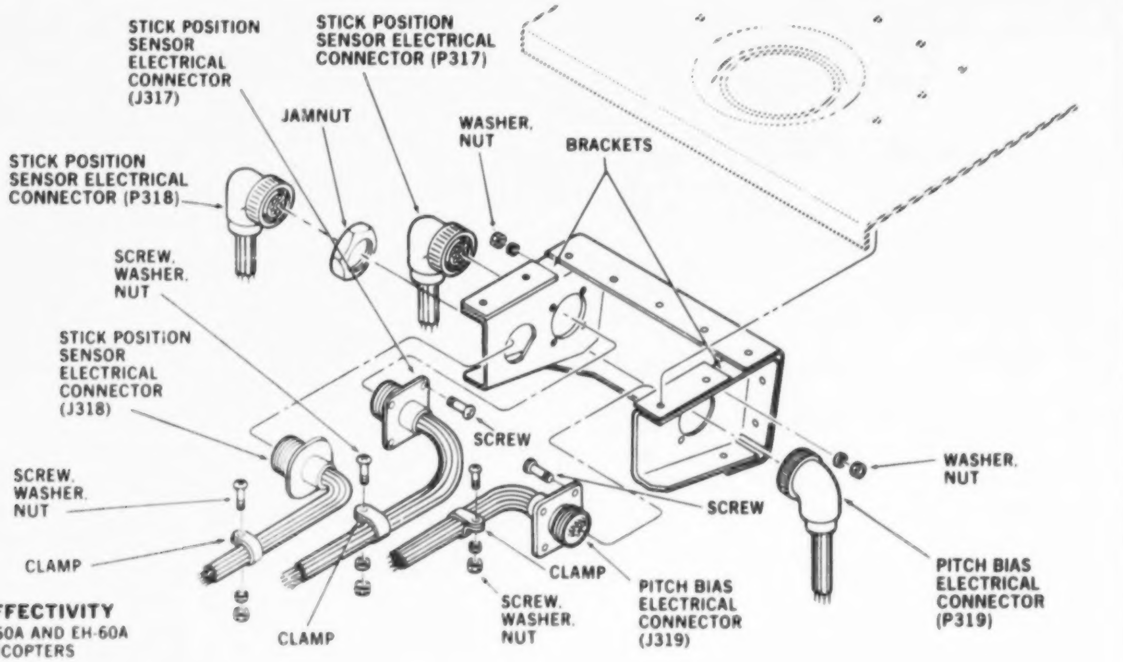
ac. Check area for cleanness and foreign material.

ad. Install soundproofing panels in cabin ceiling.

ae. Close main rotor pylon sliding cover.

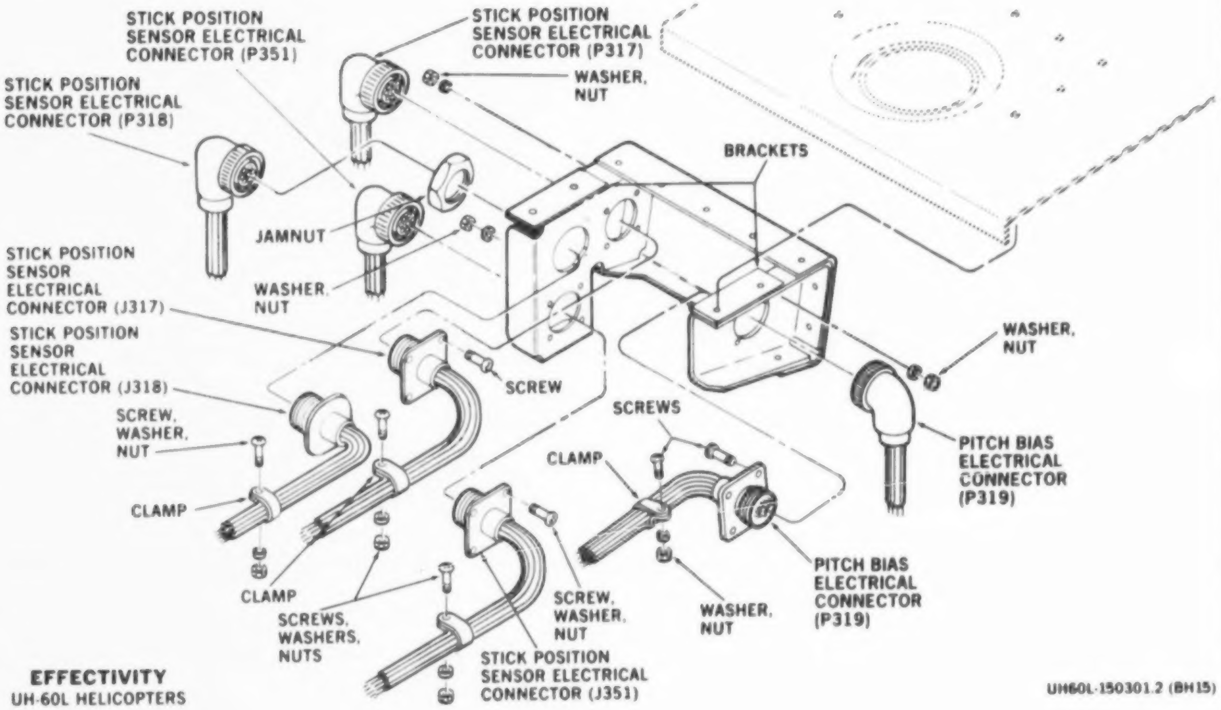
af. Do a maintenance test flight (TM 55-1520-237-MTF).

11-17.1 REPLACE MIXER 11-17.1


STICK POSITION SENSOR ELECTRICAL CONNECTOR (J317)
STICK POSITION SENSOR ELECTRICAL CONNECTOR (P317)
JAMNUT
WASHER, NUT
BRACKETS
STICK POSITION SENSOR ELECTRICAL CONNECTOR (P318)
SCREW, WASHER, NUT
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J318)
SCREW
WASHER, NUT
SCREW, WASHER, NUT
SCREW
CLAMP
CLAMP
PITCH BIAS ELECTRICAL CONNECTOR (P319)
SCREW, WASHER, NUT
PITCH BIAS ELECTRICAL CONNECTOR (J319)
CLAMP

EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS

UH60L-150301.1 (B)


STICK POSITION SENSOR ELECTRICAL CONNECTOR (P351)
STICK POSITION SENSOR ELECTRICAL CONNECTOR (P317)
WASHER, NUT
STICK POSITION SENSOR ELECTRICAL CONNECTOR (P318)
BRACKETS
JAMNUT
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J317)
WASHER, NUT
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J318)
SCREW
WASHER, NUT
SCREW, WASHER, NUT
SCREWS
CLAMP
CLAMP
PITCH BIAS ELECTRICAL CONNECTOR (P319)
CLAMP
SCREWS, WASHERS, NUTS
SCREW, WASHER, NUT
WASHER, NUT
PITCH BIAS ELECTRICAL CONNECTOR (P319)
STICK POSITION SENSOR ELECTRICAL CONNECTOR (J351)

EFFECTIVITY
UH-60L HELICOPTERS

UH60L-150301.2 (BH15)

FIGURE 11-74

11-17.2 REPAIR MIXER 11-17.2

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

a. Turn off all electrical and hydraulic power.

b. Open main rotor pylon sliding cover.

c. Connect external electrical power or run APU (PARA 1-6.3).

d. Turn on backup hydraulic system.

e. Disconnect forward, aft, and lateral control rods from primary servos (PARA 11-27).

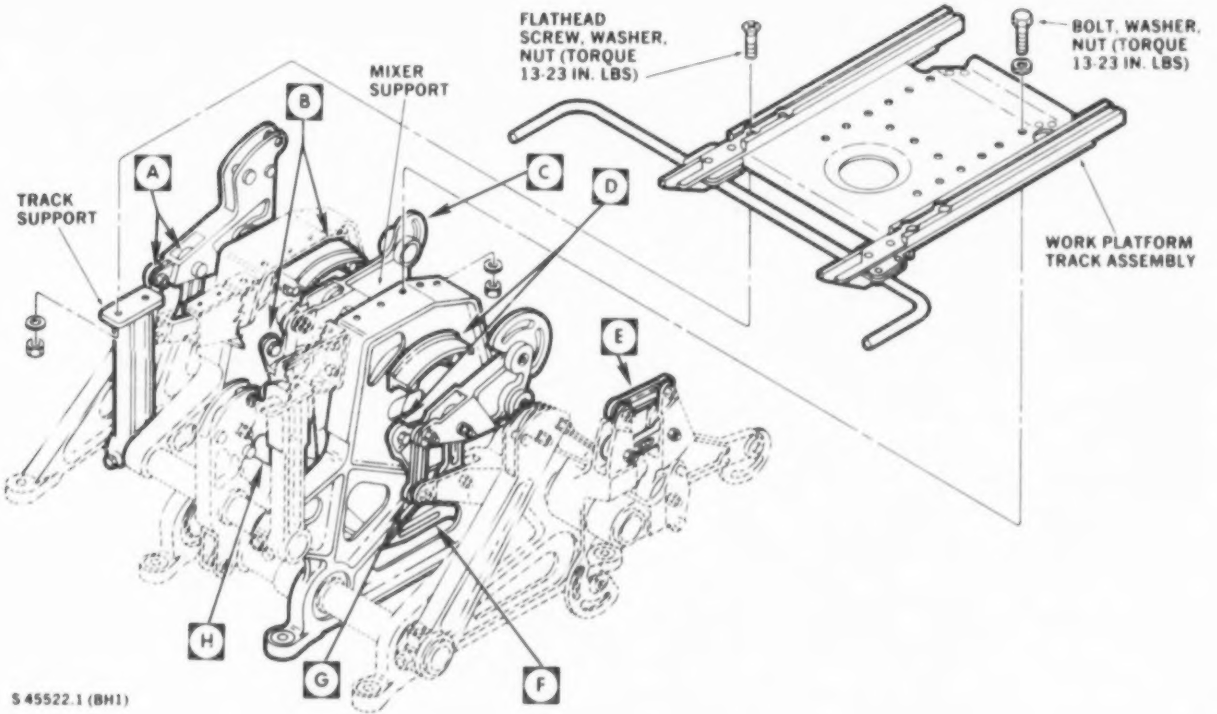
f. Remove work platform from mixer (PARA 2-43).

g. Unscrew and unbolt work platform track assembly from mixer.

REPLACE FORWARD INPUT-OUTPUT LINKS

h. Inspect small and large link bearings with a dial indicator. **REPLACE LINK IF RADIAL PLAY IS 0.005 INCH OR GREATER.**

i. Check small and large link bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). **REPLACE LINK WITH BEARINGS THAT HAVE ROUGHNESS, STICKING, AND SEAL DAMAGE.**


FLATHEAD SCREW, WASHER, NUT (TORQUE 13-23 IN. LBS)
BOLT, WASHER, NUT (TORQUE 13-23 IN. LBS)
MIXER SUPPORT
TRACK SUPPORT
WORK PLATFORM TRACK ASSEMBLY
A
B
C
D
E
F
G
H

S 45522.1 (BH1)

FIGURE 11-75 (SHEET 1 OF 11)

j. Inspect small and large link for loose bearings, corrosion, and damage. Blend out any corrosion with crocus cloth, Item 128, Appendix D. **REPLACE LINKS IF CORROSION IS DEEPER THAN 0.010 INCH AFTER BLENDING.**

k. Inspect small and large link for nicks and scratches. Blend out any damage with crocus cloth, Item 128, Appendix D. **REPLACE LINKS IF NICKS AND SCRATCHES ARE GREATER THAN 0.030 INCH AFTER BLENDING.**

l. Unbolt small and large links from forward output and forward input bellcranks.

NOTE

- On helicopters with mixer, 70400-02300-041 or 70400-02300-043, install small link, 70400-02232-042, and large link, 70400-02154-042.
- On helicopters with mixer, 70400-02300-044, 70400-02300-045, 70400-02300-046 or 70400-02300-048, install small link, 70400-02232-046.
- On helicopters with mixer, 70400-02300-044 or 70400-02300-045, install large link, 70400-02154-047.
- On helicopters with mixer, 70400-02300-046 or 70400-02300-048, install large link, 70400-02154-053.

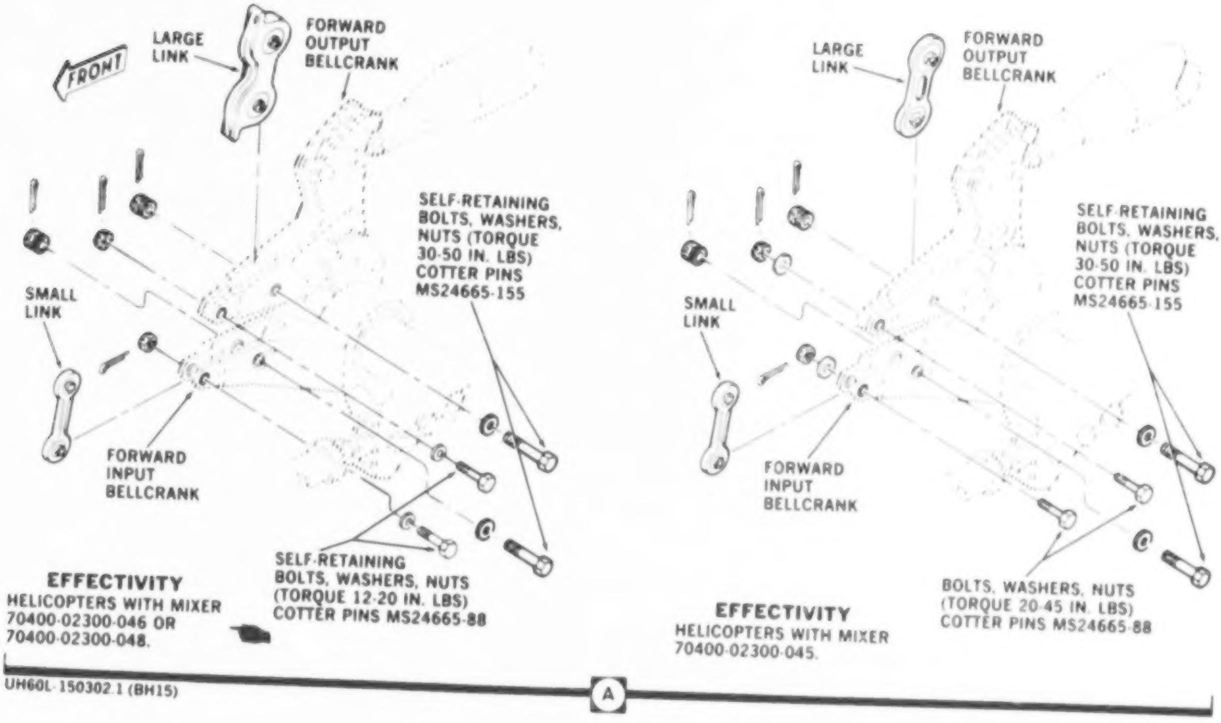

FRONT
LARGE LINK
FORWARD OUTPUT BELLCRANK
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-155
SMALL LINK
FORWARD INPUT BELLCRANK
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 12-20 IN. LBS) COTTER PINS MS24665-88
EFFECTIVITY
HELICOPTERS WITH MIXER 70400-02300-046 OR 70400-02300-048.
LARGE LINK
FORWARD OUTPUT BELLCRANK
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-155
SMALL LINK
FORWARD INPUT BELLCRANK
BOLTS, WASHERS, NUTS (TORQUE 20-45 IN. LBS) COTTER PINS MS24665-88
EFFECTIVITY
HELICOPTERS WITH MIXER 70400-02300-045.
UH60L-150302.1 (BH15)
A

FIGURE 11-75 (SHEET 2 OF 11)

m. Install replacement large link between bellcranks.

n. Install self-retaining bolt and washers (under head) (PARA 11-1).

o. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

p. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

q. On helicopters with mixer, 70400-02300-041, 70400-02300-043, 70400-02300-044, or 70400-02300-045, install replacement small link between bellcranks. Install bolts, washers, and nuts. **TORQUE NUTS TO 20 - 45 INCH-POUNDS.** Install cotter pins, MS24665-88.

r. On helicopters with mixer, 70400-2300-046, place replacement small link between bellcranks.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

s. Install self-retaining bolt and washers (under head) (PARA 11-1).

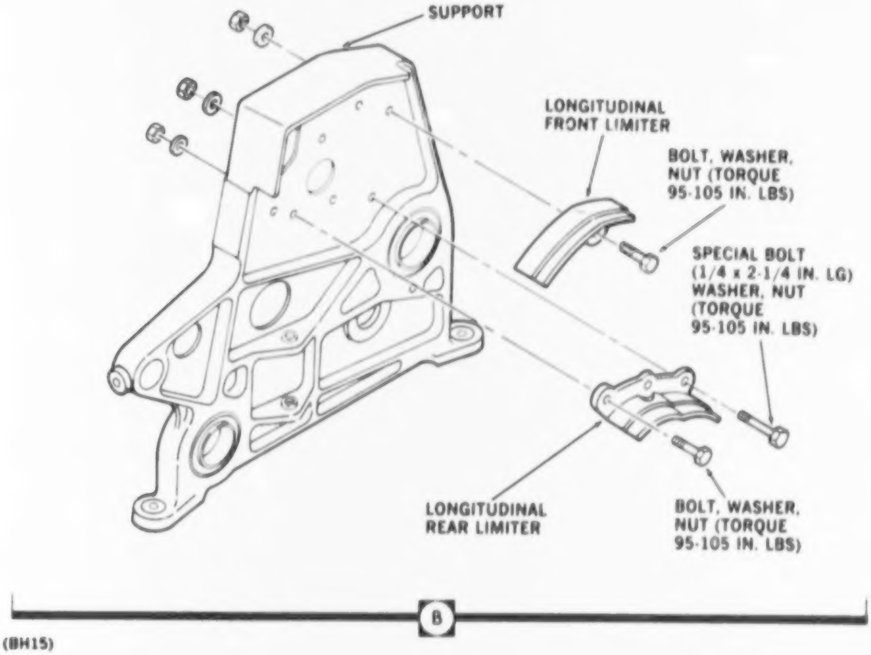

SUPPORT
LONGITUDINAL FRONT LIMITER
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
SPECIAL BOLT (1/4 x 2-1/4 IN. LG) WASHER, NUT (TORQUE 95-105 IN. LBS)
LONGITUDINAL REAR LIMITER
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
B
UH60L-150302.2 (BH15)

FIGURE 11-75 (SHEET 3 OF 11)

11-17.2 REPAIR MIXER

t. Install nut on bolt. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-155.

u. **PROOF TORQUE BOLTHEAD TO 10 - 12 INCH-POUNDS.** Apply slippage mark.

REPLACE LONGITUDINAL FRONT/LONGITUDINAL REAR LIMITERS

v. Unbolt longitudinal front limiter and longitudinal rear limiter from mixer support (Figure 11-75, Sheet 3, Detail B).

w. Bolt replacement longitudinal front limiter and longitudinal rear limiter to mixer support with bolts, washers, nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

NOTE

The special bolt, 1/4 x 2-1/4 inches long, is installed in the aft hole of the pitch aft limiter. Torque on nut is same as on other bolts.

REPLACE REAR LONGITUDINAL OUTPUT BELLCRANK AND LINKS

REMOVE

x. Unbolt aft control rod from rear longitudinal output bellcrank (Figure 11-75, Sheet 4, Detail C).

y. Unbolt small and large link from rear longitudinal and rear longitudinal output bellcranks.

z. Unbolt rear longitudinal output bellcrank from collective arm.

INSPECT/REPAIR

aa. Inspect small link, large link, and bellcrank bearings with dial indicator (TM 55-1500-204-25/1). **REPLACE LINKS AND BELLCRANKS IF RADIAL PLAY IS 0.005 INCH OR GREATER.**

ab. Check small link, large link, and bellcrank bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). **REPLACE LINKS AND BELLCRANKS THAT HAVE ROUGHNESS, STICKING, AND SEAL DAMAGE.**

ac. Inspect small link, large link, and bellcrank for loose bearings, corrosion, and damage. **REPLACE LINKS AND BELLCRANKS IF CORROSION EXCEEDS 0.010 INCH.**

ad. Inspect small link, large link, and bellcrank for nicks and scratches. **REPLACE LINKS AND BELLCRANKS IF NICKS AND SCRATCHES EXCEED 0.030 INCH.**

ae. Inspect bellcrank bushings, NAS537-4P86 and NAS538-4P11 using slide caliper. **INSIDE DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.2505 INCH.** Inspect bellcrank bushings, NAS538-3P9 and SS4045-3P19 using slide caliper. **INSIDE DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.2005 INCH.**

af. Check longitudinal limiter roller for gouges, cracks, sticking, and corrosion.

ag. **REPLACE ROLLERS GOUGED DEEPER THAN 0.050 INCH.**

ah. **NO CRACKS ALLOWED.** Repair or replace corroded parts (TM 43-0105).

INSTALL

ai. Install replacement rear longitudinal output bellcrank in clevis of collective arm.

11-17.2 REPAIR MIXER 11-17.2

aj. Install self-retaining bolt and washers (under head) (PARA 11-1).

ak. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

al. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

am. To install limiter roller on self-retaining bolt, do this:

(1) Coat bushing with grease, Item 168, Appendix D.

(2) Install washer(s) on self-retaining bolt (PARA 11-1).

(3) Install bushing on self-retaining bolt.

(4) Slip limiter roller over bushing.

NOTE

- On helicopters with mixer, 70400-02300-041, or 70400-02300-043, install large link, 70400-02154-043.
- On helicopters with mixer, 70400-02300-044, or 70400-02300-045, install large link, 70400-02154-048.
- On helicopters with mixer, 70400-02300-046 or 70400-02300-048, install large link, 70400-02154-054.

an. Install upper end of large link on rear longitudinal bellcranks.

ao. Install self-retaining bolt with limiter roller, washers, and upper end of large link (PARA 11-1).

ap. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

aq. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ar. Install lower end of large link on longitudinal bellcrank.

as. Install self-retaining bolt and washers (under head) (PARA 11-1).

at. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

au. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

WARNING

To prevent damage to equipment and injury to personnel due to restriction of flight control travel on helicopters prior to serial No. 79-23309, insert an inspection mirror under work platform track assembly and check to make sure bolt is attaching rear longitudinal output bellcrank and upper end of large link. On helicopters serial Nos 79-23309 and subsequent, look through work platform track assembly to be sure of correct bolt installation. Physically hold large link and apply moderate force to confirm link is secured in place by bolt.

av. On helicopters with mixer, 70400-02300-041 or 70400-02300-043, install small link, 70400-02232-044, between upper and lower rear longitudinal bellcranks with bolts, washers, and nuts. **TORQUE NUTS TO 20 - 45 INCH-POUNDS.** Install cotter pins, MS24665-88 (Figure 11-75, Sheet 4, Detail C).

11-17.2 REPAIR MIXER 11-17.2

aw. On helicopters with mixer, 70400-02300-045, install small link, 70400-02232-048, between upper and lower rear longitudinal bellcranks with bolts, washers, and nuts. **TORQUE NUTS TO 20 - 45 INCH-POUNDS.** Install cotter pins, MS24665-88 (Figure 11-75, Sheet 4, Detail C).

ax. On helicopters with mixer, 70400-02300-046 or 70400-02300-048, place small link attached to rear longitudinal output bellcrank assembly, 70400-02212-048, on lower rear longitudinal bellcrank.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

ay. Install self-retaining bolt and washers (under head) (PARA 11-1).

az. Install nut on bolt. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-88.

ba. **PROOF TORQUE BOLTHEAD TO 10 - 12 INCH-POUNDS.** Apply slippage mark.

NOTE

All boltheads must face to right side.

bb. Connect aft control rod to rear longitudinal output bellcrank and primary servo (PARA 11-27).

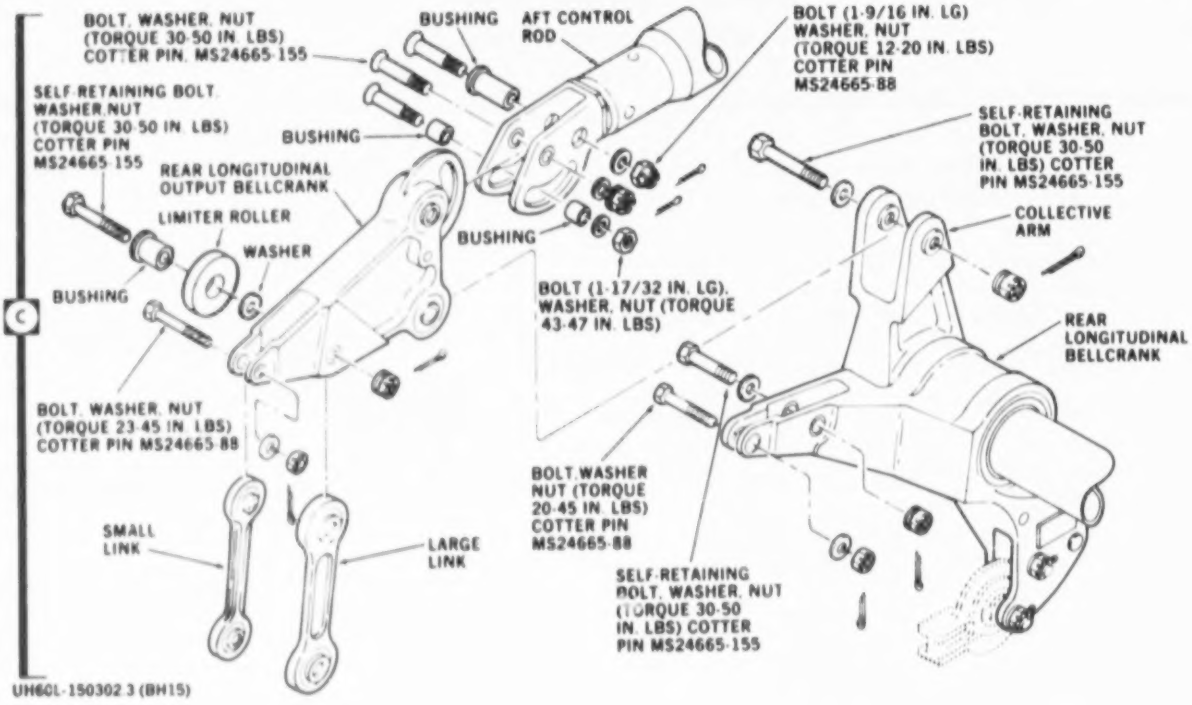
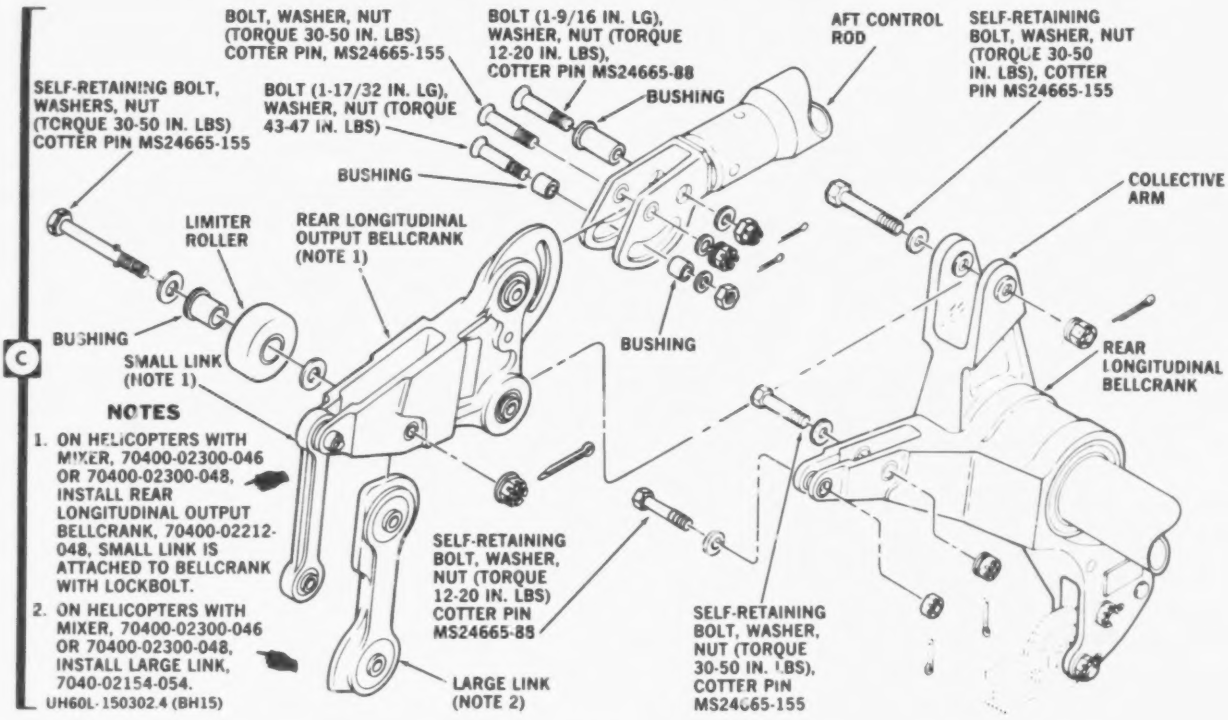

BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BUSHING
AFT CONTROL ROD
BOLT (1-9/16 IN. LG) WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BUSHING
REAR LONGITUDINAL OUTPUT BELLCRANK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
LIMITER ROLLER
COLLECTIVE ARM
WASHER
BUSHING
BUSHING
C
BOLT (1-17/32 IN. LG), WASHER, NUT (TORQUE 43-47 IN. LBS)
REAR LONGITUDINAL BELLCRANK
BOLT, WASHER, NUT (TORQUE 23-45 IN. LBS) COTTER PIN MS24665-88
BOLT, WASHER NUT (TORQUE 20-45 IN. LBS) COTTER PIN MS24665-88
SMALL LINK
LARGE LINK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
UH60L-150302.3 (BH15)

FIGURE 11-75 (SHEET 4 OF 11)

11-17.2 REPAIR MIXER


BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BOLT (1-9/16 IN. LG), WASHER, NUT (TORQUE 12-20 IN. LBS), COTTER PIN MS24665-88
AFT CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS), COTTER PIN MS24665-155
SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-17/32 IN. LG), WASHER, NUT (TORQUE 43-47 IN. LBS)
BUSHING
BUSHING
COLLECTIVE ARM
LIMITER ROLLER
REAR LONGITUDINAL OUTPUT BELLCRANK (NOTE 1)
BUSHING
BUSHING
C
SMALL LINK (NOTE 1)
REAR LONGITUDINAL BELLCRANK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS), COTTER PIN MS24665-155
LARGE LINK (NOTE 2)

NOTES

1. ON HELICOPTERS WITH MIXER, 70400-02300-046 OR 70400-02300-048, INSTALL REAR LONGITUDINAL OUTPUT BELLCRANK, 70400-02212-048, SMALL LINK IS ATTACHED TO BELLCRANK WITH LOCKBOLT.
2. ON HELICOPTERS WITH MIXER, 70400-02300-046 OR 70400-02300-048, INSTALL LARGE LINK, 7040-02154-054.

UH60L-150302.4 (BH15)

FIGURE 11-75 (SHEET 5 OF 11)

REPLACE LEFT AND RIGHT LATERAL LIMITERS

bc. Unbolt right and left lateral limiter from mixer support (Detail D).

bd. Install right lateral limiter on top holes of mixer support and install bolts, washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

be. Install left lateral limiter on bottom holes of mixer support and install bolts, washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

REPLACE COLLECTIVE OUTPUT LINKS

bf. Unbolt small and large links from yaw ouput lever and collective output bellcrank (Figure 11-73, Sheet 7, Detail E).

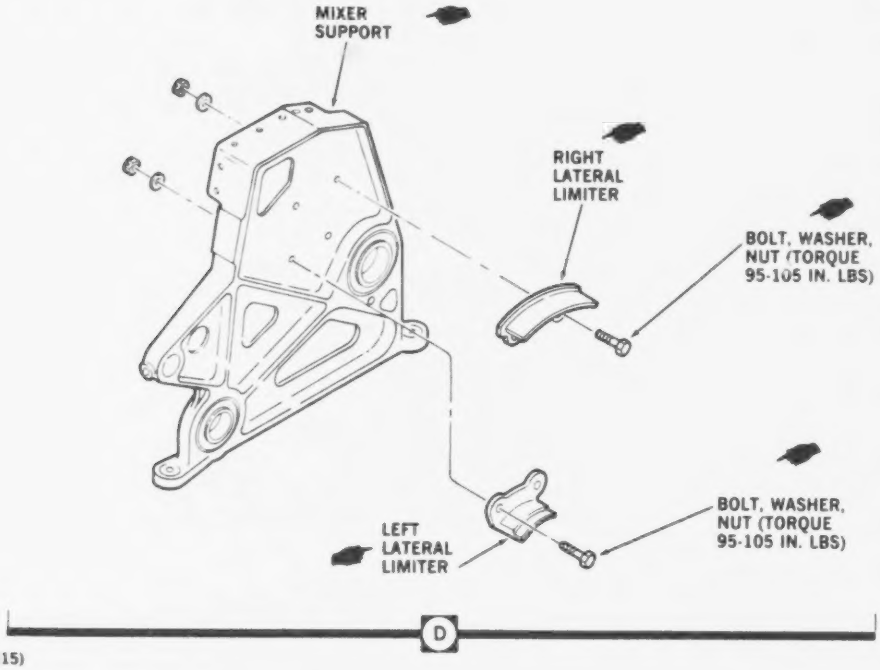
bg. Inspect small and large link bearings with a dial indicator. **REPLACE LINK IF RADIAL PLAY IS 0.005 INCH OR GREATER.**

bh. Check small and large link bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). **REPLACE LINKS WITH BEARINGS THAT HAVE ROUGHNESS, STICKING, AND SEAL DAMAGE.**

bi. Inspect small and large link for loose bearings, corrosion, and damage. Blend out any corrosion with crocus cloth, Item 128, Appendix D. **REPLACE LINKS IF CORROSION EXCEEDS 0.010 INCH AFTER BLENDING.**

bj. Inspect small and large link for nicks and scratches. Blend out any damage with crocus cloth, Item 128, Appendix D. **REPLACE LINKS IF NICKS AND SCRATCHES EXCEED 0.030 INCH AFTER BLENDING.**

11-17.2 REPAIR MIXER 11-17.2


MIXER SUPPORT
RIGHT LATERAL LIMITER
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
LEFT LATERAL LIMITER
D

UH60L-150302.5 (BH15)

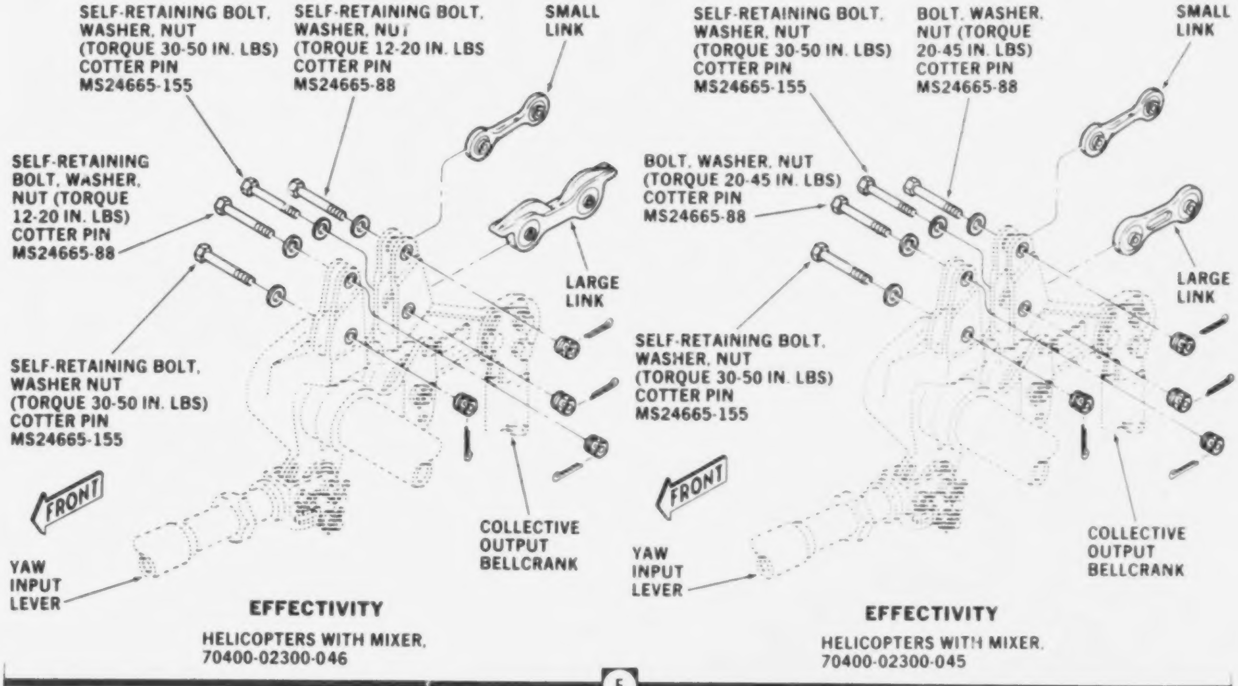
FIGURE 11-75 (SHEET 6 OF 11)

NOTE

- On helicopters with mixer, 70400-02300-041 or 70400-02300-043, install small link, 70400-02232-043.
- On helicopters with mixer, 70400-02300-044, 70400-02300-045, 70400-02300-046 or 70400-02300-048, install small link, 70400-02232-047.
- On helicopters with mixer, 70400-02300-041 or 70400-02300-043, install large link, 70400-02154-046.
- On helicopters with mixer, 70400-02300-044, or 70400-02300-045, install large link, 70400-02154-049.
- On helicopters with mixer, 70400-02300-046 or 70400-02300-048, install large link, 70400-02154-050.

bk. Install large link between yaw input lever and collective output bellcrank (Figure 11-75, Sheet 7, Detail E).

11-17.2 REPAIR MIXER 11-17.2


SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS COTTER PIN MS24665-88
SMALL LINK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
LARGE LINK
SELF-RETAINING BOLT, WASHER NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
FRONT
COLLECTIVE OUTPUT BELLCRANK
YAW INPUT LEVER
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT, WASHER, NUT (TORQUE 20-45 IN. LBS) COTTER PIN MS24665-88
SMALL LINK
BOLT, WASHER, NUT (TORQUE 20-45 IN. LBS) COTTER PIN MS24665-88
LARGE LINK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
FRONT
COLLECTIVE OUTPUT BELLCRANK
YAW INPUT LEVER

EFFECTIVITY

HELICOPTERS WITH MIXER,
70400-02300-046

EFFECTIVITY

HELICOPTERS WITH MIXER,
70400-02300-045

E

S 45522.6 (BH4)

FIGURE 11-75 (SHEET 7 OF 11)

bl. Install self-retaining bolt and washers (under head) (PARA 11-1).

bm. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

bn. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-17.2 REPAIR MIXER 11-17.2

bo. On helicopters with mixer, 70400-02300-041, 70400-02300-043, 70400-02300-044, or 70400-02300-045, install small link between yaw input lever and collective output bellcrank. Install bolts, washers, and nuts. **TORQUE NUTS TO 20 - 45 INCH-POUNDS.** Install cotter pin, MS24665-88.

bp. On helicopters with mixer, 70400-02300-046 or 70400-02300-048, place small link between yaw input lever and collective output bellcrank.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

bq. Install self-retaining bolt and washers (under head) (PARA 11-1).

br. Install nut on bolt. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-88.

bs. **PROOF TORQUE BOLTHEAD TO 10 - 12 INCH-POUNDS.** Apply slippage mark.

REPLACE REAR AND FRONT SERVO LINK

bt. Unbolt bushing from clevis of lateral input lever (Figure 11-75, Sheet 8, Detail F).

bu. Unbolt link from lateral input lever and walking beam.

bv. Install replacement link between walking beam and lateral input lever.

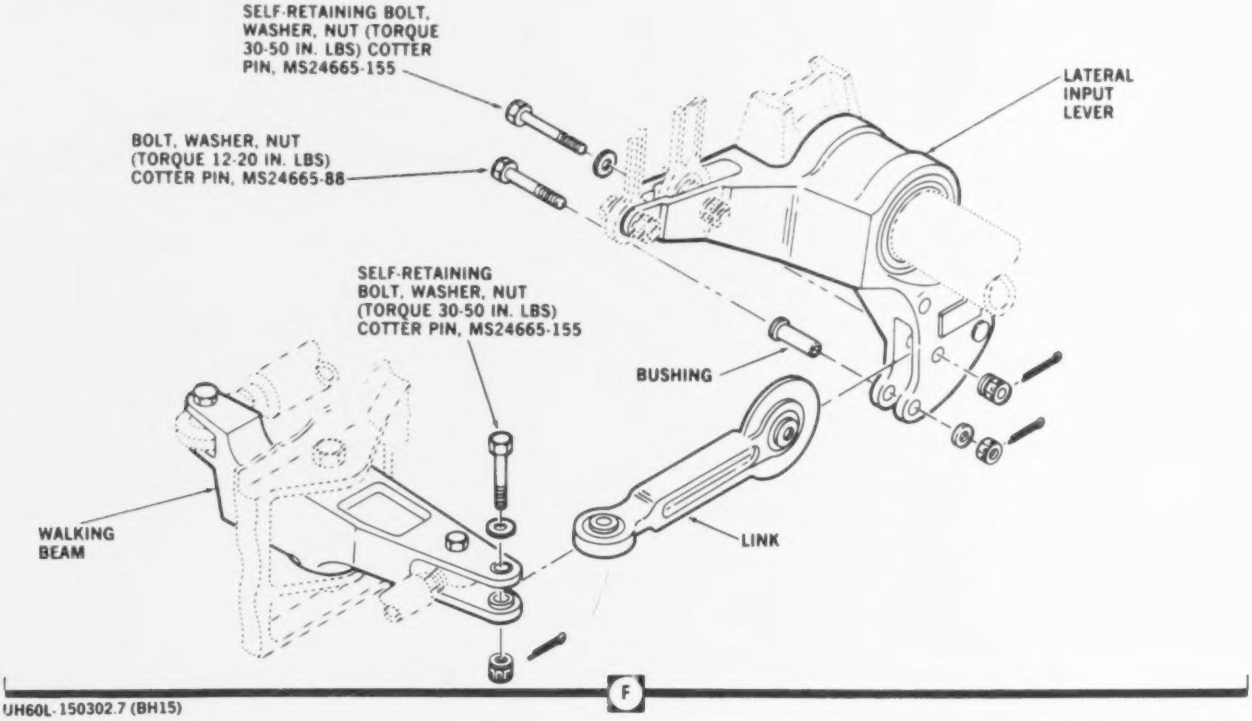

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN, MS24665-88
LATERAL INPUT LEVER
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BUSHING
WALKING BEAM
LINK
F
UH60L-150302.7 (BH15)

FIGURE 11-75 (SHEET 8 OF 11)

11-17.2 REPAIR MIXER 11-17.2

bw. Install self-retaining bolt and washers (under head) (PARA 11-1).

bx. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

by. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bz. Install bushing in clevis and install bolt, washer, nut. **TORQUE NUT 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-88.

REPLACE LATERAL OUTPUT LEVER AND LINKS

REMOVE

ca. Unbolt lateral control rod from lateral output lever (PARA 11-27).

cb. Unbolt small and large links from lateral output lever and lateral input lever. Remove limiter roller, bushing, and washer from self-retaining bolt.

cc. Unbolt lateral output lever from lateral bellcrank.

INSPECT/REPAIR

cd. Inspect small link, large link, and lever bearings using dial indicator (TM 55-1500-204-25/1). **REPLACE LINKS AND LEVERS IF RADIAL PLAY IS 0.005 INCH OR GREATER.**

ce. Check small link, large link, and lever bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). **REPLACE LINKS AND LEVERS THAT HAVE ROUGHNESS, STICKING, AND SEAL DAMAGE.**

cf. Inspect small link, large link, and lever bearings for looseness, corrosion, and damage. **REPLACE LINKS AND LEVERS IF CORROSION EXCEEDS 0.010 INCH.**

cg. Inspect small link, large link, and lever bearings for nicks and scratches. **REPLACE LINKS AND LEVERS IF NICKS AND SCRATCHES EXCEED 0.030 INCH.**

ch. Inspect lever bushings, NAS537-4P86 and NAS538-4P9 using slide caliper. **INSIDE DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.2505 INCH.** Inspect lever bushings, NAS538-3P9 and SS4045-3P18 using slide caliper. **INSIDE DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.1900 INCH.**

ci. Check lateral limiter roller for gouges, cracks, roughness, sticking, and corrosion.

cj. **REPLACE ROLLERS SHOWING DAMAGE DEEPER THAN 0.050 INCH.**

ck. **NO CRACKS ALLOWED.** Repair or replace corroded parts (TM 43-0105).

INSTALL

cl. Install replacement lateral output lever in lateral bellcrank.

cm. Install self-retaining bolt and washers (under head) (PARA 11-1).

cn. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

co. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-17.2 REPAIR MIXER

cp. To install limiter roller on self-retaining bolt, do this:

(1) Coat bushing with grease, Item 168, Appendix D.

(2) Install washer(s) on self-retaining bolt (PARA 11-1).

(3) Install bushing on self-retaining bolt.

(4) Slip limiter roller over bushing.

WARNING

To prevent damage to equipment and injury to personnel due to restriction of flight control travel, check to make sure bolt is attaching rear lateral output bellcrank and upper end of large link. Physically hold large link and apply moderate force to confirm that link is secured.

NOTE

- On helicopters with mixer, 70400-02300-041 or 70400-02300-043, install small link, 70400-02232-041, and large link, 70400-02239-041 (Figure 11-75).
- On helicopters with mixer, 70400-02300-044 or 70400-02300-045, install small link, 70400-02232-045, and large link, 70400-02239-042 (Figure 11-75).
- On helicopters with mixer, 70400-02300-046 or 70400-02300-048, install large link, 70400-02239-043. Small link should be attached to lateral output lever. Do not remove lockbolt.

cq. Install upper end of large link on lateral output levers.

cr. Install self-retaining bolt with limiter roller and washer on upper end of large link (PARA 11-1).

cs. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

ct. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

cu. Install lower end of large link on lateral bellcrank.

cv. Install self-retaining bolt and washers (under head) (PARA 11-1).

cw. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

cx. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

cy. On helicopters with mixer, 70400-02300-041, 70400-02300-043, 70400-02300-044, or 70400-02300-045, install small link between lateral output and input levers. Install bolts, washers, and nuts. **TORQUE NUTS TO 20 - 45 INCH-POUNDS.** Install cotter pins, MS24665-88.

cz. On helicopters with mixer, 70400-02300-046 or 70400-02300-048, place small link attached to lateral output lever assembly, 70400-02209-046, on lateral bellcrank.

da. Connect lateral control rod to lateral output lever and lateral primary servo (PARA 11-27).

11-17.2 REPAIR MIXER 11-17.2

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

db. Install self-retaining bolt and washers (under head) (PARA 11-1).

dc. Install nut on bolt. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-88.

dd. **PROOF TORQUE BOLTHEAD TO 10 - 12 INCH-POUNDS.** Apply slippage mark.

REPLACE YAW/PITCH COUPLING

REMOVE

NOTE

Yaw/pitch lever and arms are a matched set. Do not try to replace separate parts.

de. Unbolt adjustable link from yaw/pitch lever (Figure 11-75, Sheet 11).

df. On helicopters with yaw/pitch coupling link, remove nuts and washers from arm assembly. Remove one arm. Remove nylon washer from link trunnion pin. Unbolt link front end from beam assembly. Remove link and remaining nylon washer (Figure 11-75, Sheet 12).

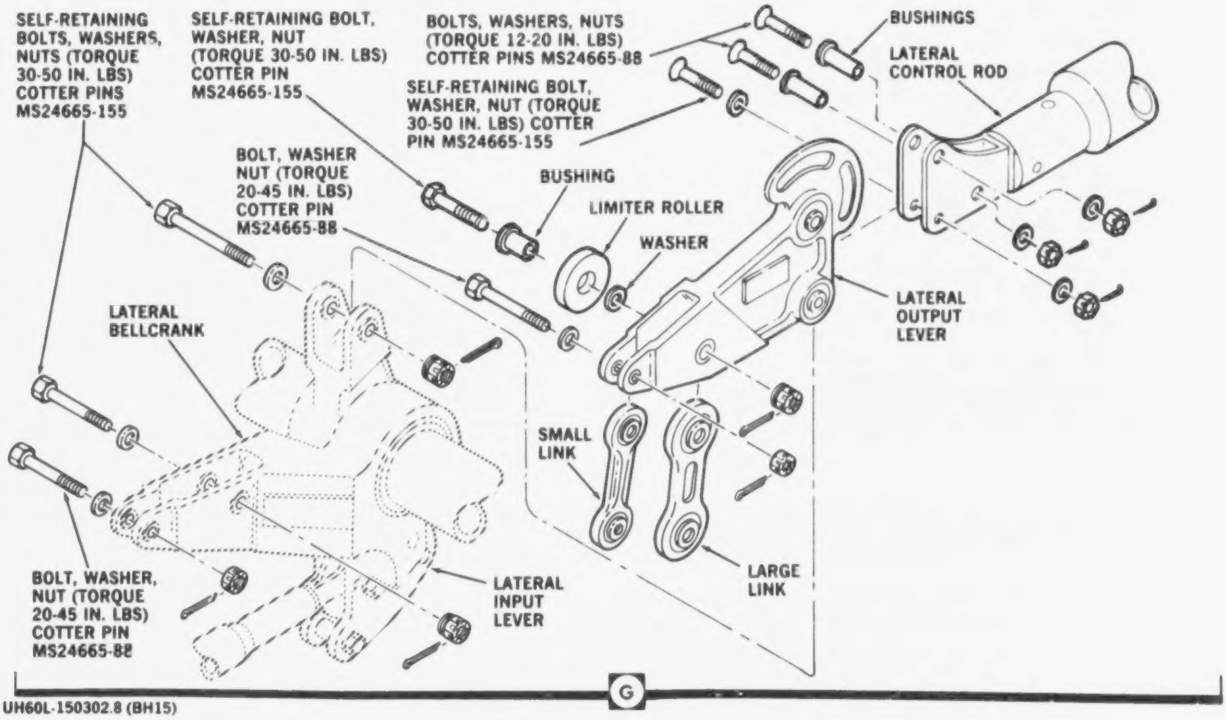
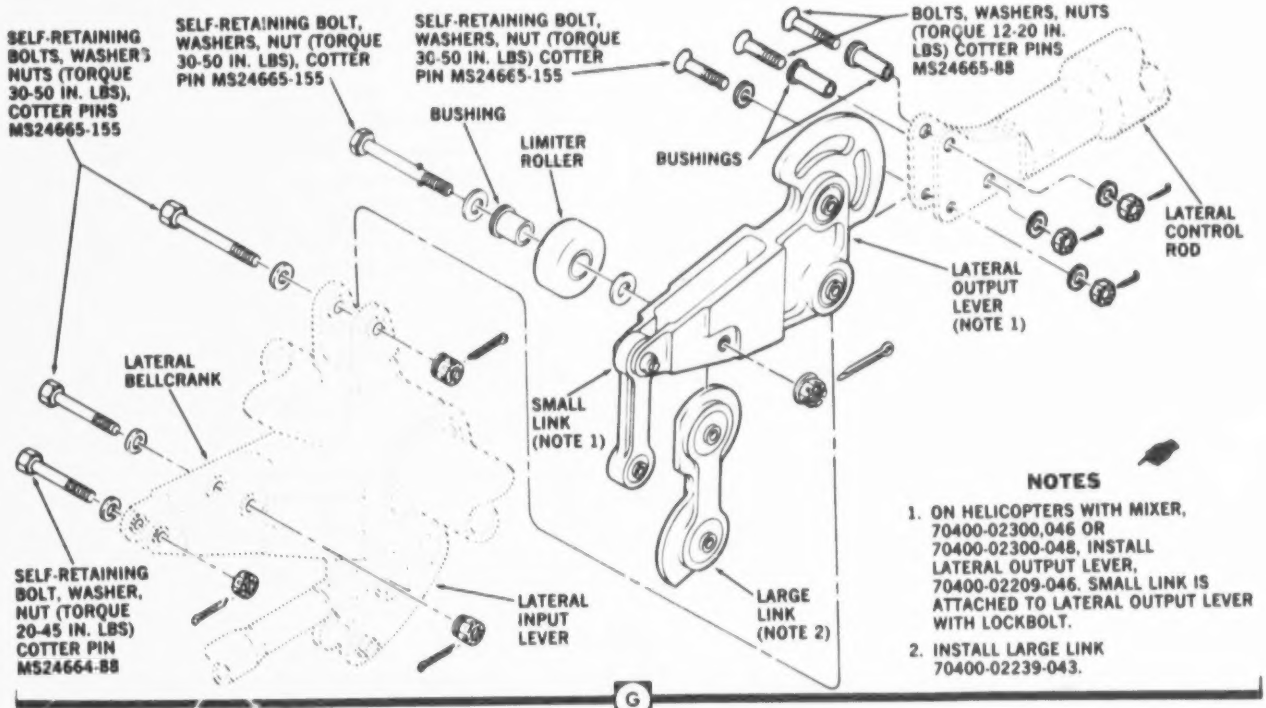

SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-155
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLTS, WASHERS, NUTS (TORQUE 12-20 IN. LBS) COTTER PINS MS24665-88
BUSHINGS
LATERAL CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT, WASHER NUT (TORQUE 20-45 IN. LBS) COTTER PIN MS24665-88
BUSHING
LIMITER ROLLER
WASHER
LATERAL BELLCRANK
LATERAL OUTPUT LEVER
SMALL LINK
BOLT, WASHER, NUT (TORQUE 20-45 IN. LBS) COTTER PIN MS24665-88
LATERAL INPUT LEVER
LARGE LINK
G
UH60L-150302.8 (BH15)

FIGURE 11-75 (SHEET 9 OF 11)

11-17.2 REPAIR MIXER


SELF-RETAINING BOLTS, WASHERS NUTS (TORQUE 30-50 IN. LBS), COTTER PINS MS24665-155
SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 30-50 IN. LBS), COTTER PIN MS24665-155
SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLTS, WASHERS, NUTS (TORQUE 12-20 IN. LBS) COTTER PINS MS24665-88
BUSHING
LIMITER ROLLER
BUSHINGS
LATERAL CONTROL ROD
LATERAL OUTPUT LEVER (NOTE 1)
LATERAL BELLCRANK
SMALL LINK (NOTE 1)
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 20-45 IN. LBS) COTTER PIN MS24664-88
LATERAL INPUT LEVER
LARGE LINK (NOTE 2)
G

NOTES

1. ON HELICOPTERS WITH MIXER, 70400-02300,046 OR 70400-02300-048, INSTALL LATERAL OUTPUT LEVER, 70400-02209-046. SMALL LINK IS ATTACHED TO LATERAL OUTPUT LEVER WITH LOCKBOLT.
2. INSTALL LARGE LINK 70400-02239-043.

UH60L-150302.9 (BH15)

FIGURE 11-75 (SHEET 10 OF 11)

dg. On helicopters with pitch bias actuator, unbolt arms from yaw/pitch lever and remove arms from pitch bias actuator. Remove nylon washers from actuator lugs.

dh. Unbolt yaw/pitch lever from support arms.

INSPECT

di. Inspect yaw/pitch coupling link as follows:

(1) Check for cracks, nicks, gouges, corrosion, or distortion. Check pivot ball bearing for condition and wear (TM 55-1500-204-25/1).

(2) Inspect large end OD and trunnion pins dry film lubricant coatings for wear or damage, which shows base metal. Check paint for damage.

(3) Check trunnion pins for wear. **EACH TRUNNION PIN OD SHALL MEASURE 0.2490 - 0.2495 INCH.**

(4) Repair or replace link as required.

dj. Inspect self-retaining bolt (PARA 11-1). **REPLACE BOLT AS REQUIRED.**

11-17.2 REPAIR MIXER 11-17.2

INSTALL

NOTE

Do not reinstall pitch bias actuator.

dk. Install replacement yaw/pitch lever between support arms.

dl. Install self-retaining bolt and washers (under head) (PARA 11-1).

dm. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

dn. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

do. Connect adjustable link to yaw/pitch lever clevis.

dp. Install self-retaining bolt and washers (under head) (PARA 11-1).

dq. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

dr. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ds. Loosely install one arm, with bolts, through lever assembly.

dt. Install nylon washers (countersinks facing link) on link trunnion pins (Figure 11-75, Sheet 12 of 12).

du. Position yaw/pitch coupling link in beam and on lever assembly arm. Install second arm on lever assembly over bolts. Put link trunnion pin through arm pivot hole. Install washers and nuts. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

dv. Install self-retaining bolt and washer through beam/link pivot hole (PARA 11-1).

dw. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

dx. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

dy. Install bushing, bolt, washer, and nut in beam assembly. **TORQUE NUT TO 12 - 32 INCH-POUNDS.** Install cotter pin, MS24665-88.

dz. Install work platform on mixer (PARA 2-43).

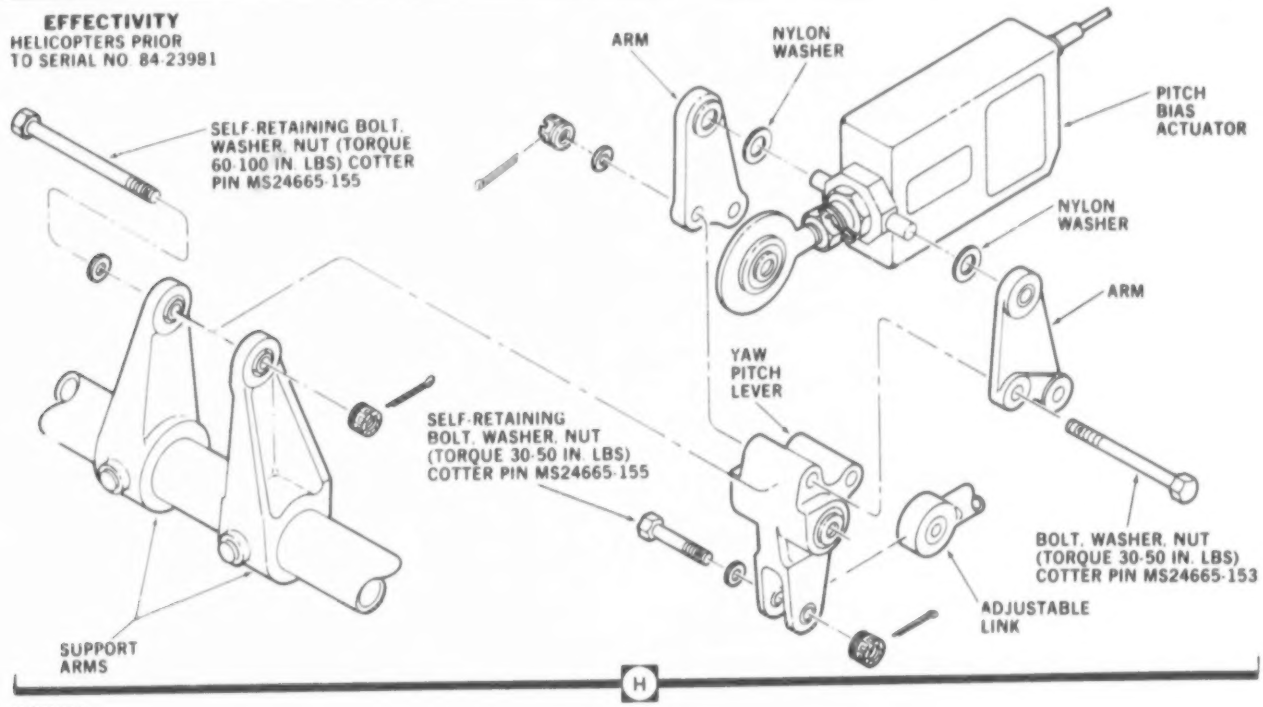
ea. Check area for cleanness and foreign material.

eb. Connect forward, aft, and lateral control rods to primary servos (PARA 11-27).

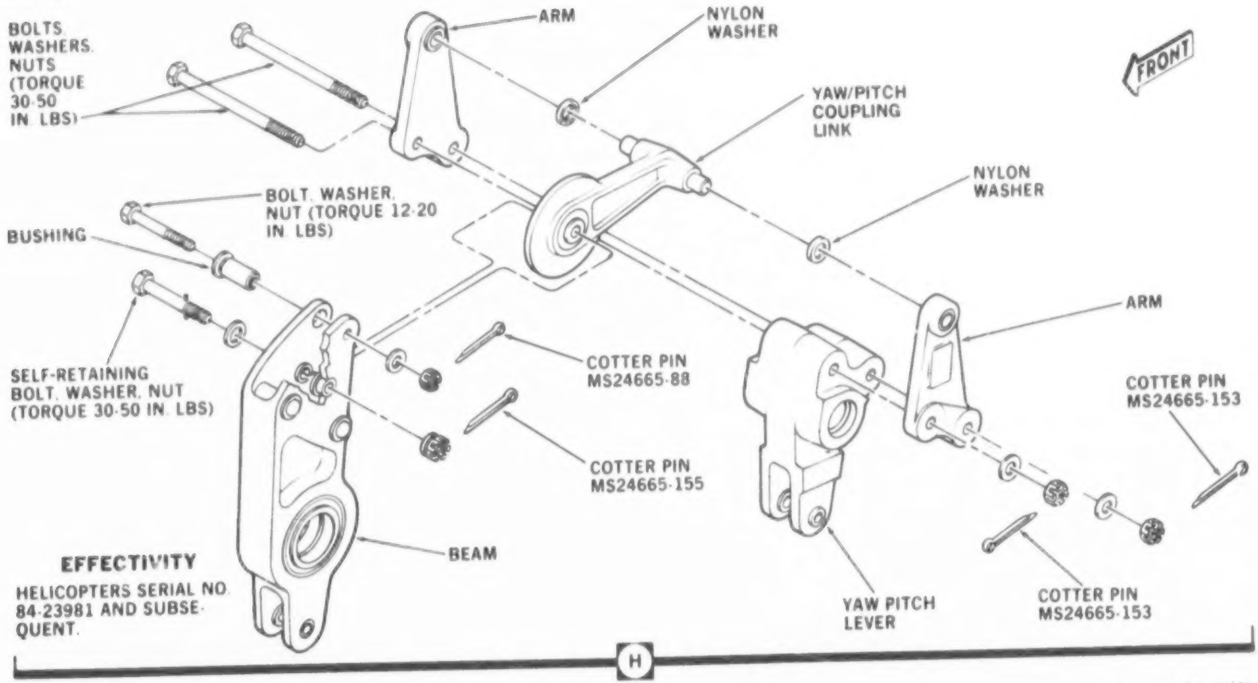
ec. Close main gear box sliding cover.

ed. Do a maintenance test flight (TM 55-1520-237-MTF).

11-17.2 REPAIR MIXER 11-17.2


EFFECTIVITY
HELICOPTERS PRIOR TO SERIAL NO. 84-23981
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-155
ARM
NYLON WASHER
PITCH BIAS ACTUATOR
NYLON WASHER
ARM
YAW PITCH LEVER
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
ADJUSTABLE LINK
SUPPORT ARMS
H

S 45522.9


BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS)
ARM
NYLON WASHER
FRONT
YAW/PITCH COUPLING LINK
BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS)
BUSHING
NYLON WASHER
ARM
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS)
COTTER PIN MS24665-88
COTTER PIN MS24665-155
COTTER PIN MS24665-153
BEAM
EFFECTIVITY
HELICOPTERS SERIAL NO. 84-23981 AND SUBSEQUENT.
YAW PITCH LEVER
COTTER PIN MS24665-153
H

S 45522.9.1 (BH4)

FIGURE 11-75 (SHEET 11 OF 11)

11-17.3 REPLACE NO. 3 COLLECTIVE STICK POSITION SENSOR 11-17.3

REMOVE

a. Turn off all electrical and hydraulic power.

b. Open main rotor pylon sliding cover.

c. Remove work platform and track assembly from mixer (PARA 2-43).

d. Start APU or connect source of external power to helicopter (PARA 1-6.3).

e. Make sure the following circuit breakers are pushed in:

  (1) DC ESNTL BUS - BACKUP HYD CONTR

  (2) NO. 1 DC PRI BUS - BACKUP PUMP PWR

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cooldown Time, Pump Off (Minutes)
90° (32°) max	Unlimited	-
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

f. Place upper console BACKUP HYD PUMP switch to AUTO.

g. Place pilot's or copilot's collective stick at mid-collective position.

h. Install rigging tool at collective boost servo-input.

i. Turn off all hydraulic power.

j. Disconnect electrical connectors, P317, P318, and P351.

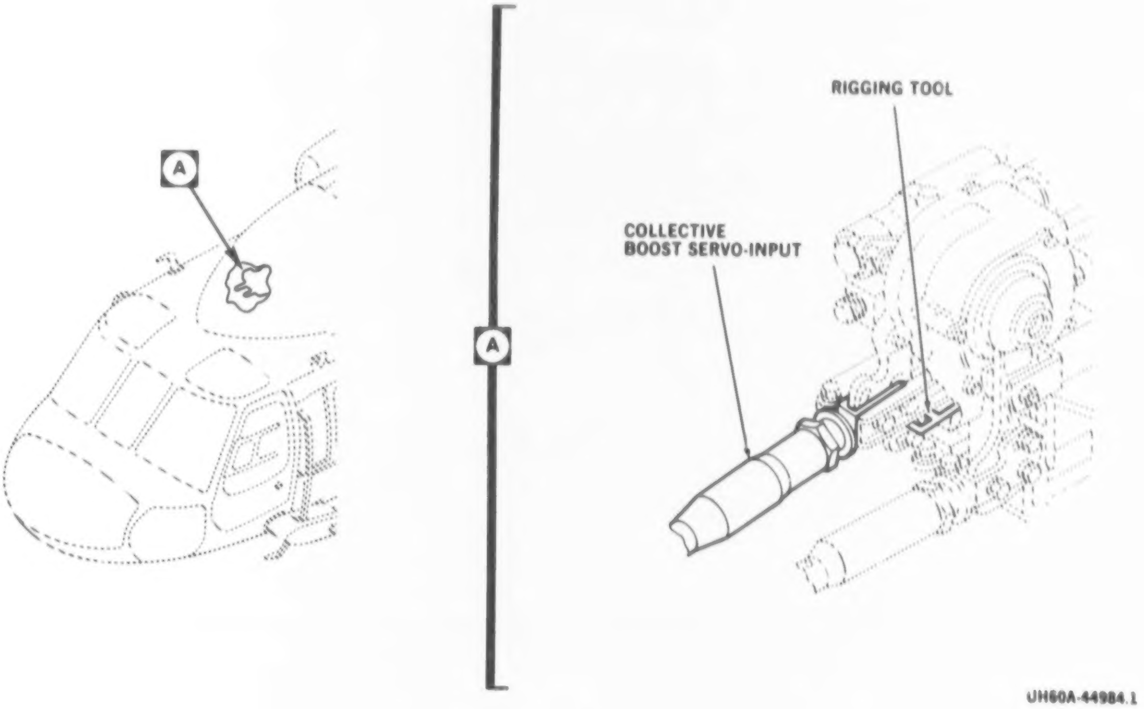


FIGURE 11-75.1

11-17.3 REPLACE NO. 3 COLLECTIVE STICK POSITION SENSOR 11-17.3

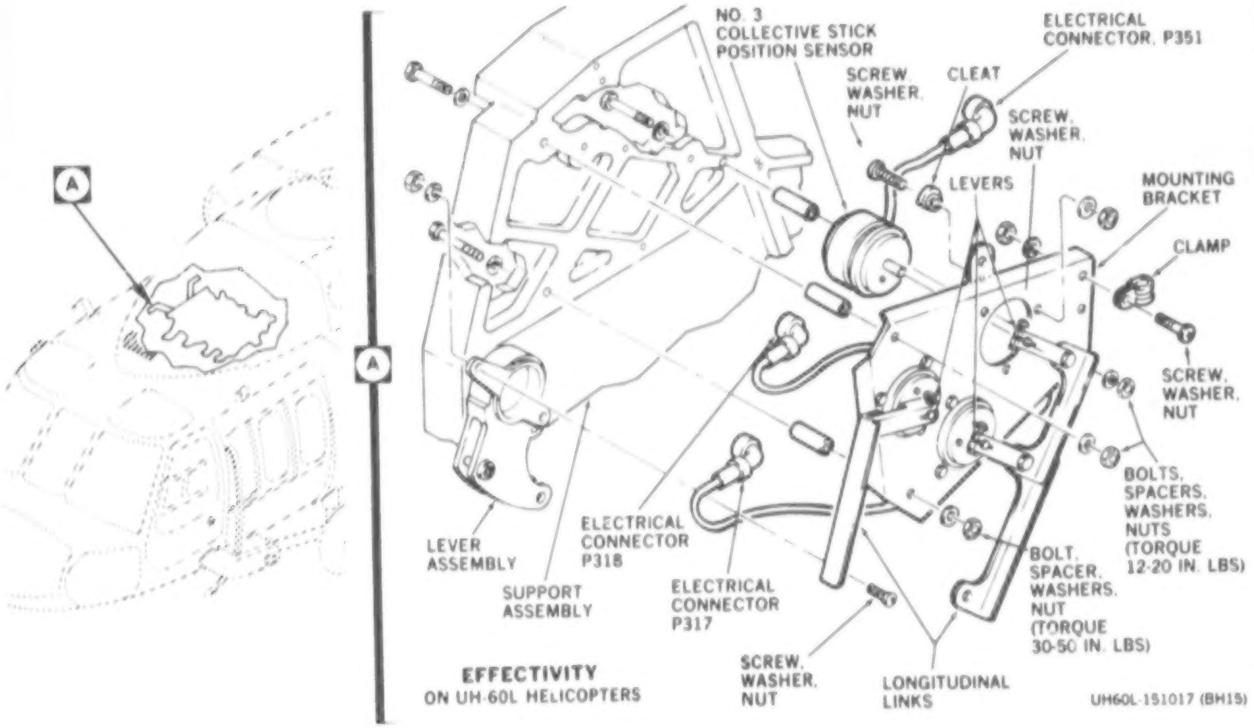

A
A
NO. 3 COLLECTIVE STICK POSITION SENSOR
ELECTRICAL CONNECTOR, P351
SCREW, WASHER, NUT
CLEAT
SCREW, WASHER, NUT
LEVERS
MOUNTING BRACKET
CLAMP
SCREW, WASHER, NUT
BOLTS, SPACERS, WASHERS, NUTS (TORQUE 12-20 IN. LBS)
BOLT, SPACER, WASHERS, NUT (TORQUE 30-50 IN. LBS)
LEVER ASSEMBLY
ELECTRICAL CONNECTOR P318
SUPPORT ASSEMBLY
ELECTRICAL CONNECTOR P317
SCREW, WASHER, NUT
LONGITUDINAL LINKS
EFFECTIVITY
ON UH-60L HELICOPTERS
UH60L-151017 (BH15)

FIGURE 11-75.2

k. Remove screws and nuts holding longitudinal links to lever assembly on mixer.

l. Remove bolts, spacers, nuts, and mounting bracket from support assembly.

m. Loosen screw and nut holding lever to No. 3 collective stick position sensor shaft.

n. Remove screws, nuts, and clamps holding No. 3 collective stick position sensor electrical connector cable to mounting bracket.

o. Remove screws, nuts, and cleats holding No. 3 collective stick position sensor and remove sensor.

INSTALL

p. Position No. 3 collective stick position sensor shaft in mounting bracket and connect lever. Do not tighten screw and nut on lever. Install sensor with screws, cleats, washers, and nuts to mounting bracket.

q. Install No. 3 collective stick position sensor electrical connector cable to mounting bracket with clamps, screws, washers, and nuts.

r. Install mounting bracket to support assembly with bolts, spacers, washers, and nuts. **TORQUE FRONT NUT AND UPPER REAR NUT TO 12-20 INCH-POUNDS. TORQUE LOWER REAR NUT TO 30-50 INCH-POUNDS.**

s. Install longitudinal links to lever assembly with screws, washers, and nuts.

t. Connect electrical connectors, P317 to J317, P318 to J318, and P351 to J351.

11-17.3 REPLACE NO. 3 COLLECTIVE STICK POSITION SENSOR 11-17.3

u. Turn on all hydraulic power.

v. Remove rigging tool from collective boost servo input.

ADJUST

w. Do a digital AFCS check and stabilator No. 1 and No. 2 collective stick sensor check (TM 11-1520-237-23-2).

x. Start APU or connect source of external power to helicopter (PARA 1-6.3).

y. Make sure the following circuit breakers are pushed in on NO. 1 DC PRI BUS:

(1) BUS TIE CONTR

(2) NO. 1 DC INST

(3) NO. 1 SERVO CONTR

(4) NO. 1 SERVO WARN

(5) LIGHTS ADVSY

(6) LIGHTS CAUT/ADVSY

(7) DC ESNTL BUS SPLY

z. Make sure the following circuit breakers are pushed in on NO. 2 DC PRI BUS:

(1) NO. 2 DC INST

(2) BATT CHG

(3) STAB PWR

aa. Make sure the following circuit breakers are pushed in on AC ESNTL BUS:

(1) AUTO XFMR

(2) INST 26V

(3) STAB INO

(4) STAB CONTR

(5) AC ESNTL BUS WARN

ab. Make sure the following circuit breakers are pushed in on NO. 2 AC PRI BUS:

(1) BATT CHG

(2) AC ESNTL BUS SPLY

(3) STAB CONTR

(4) NO. 2 CONVERTER

ac. Make sure the following circuit breakers are pushed in on DC ESNTL BUS:

(1) BATT BUS SPLY

(2) CAUT/ADVSY PNL

(3) ESNTL DC BUS SENSE

(4) FIRE DET NO. 1 ENG

(5) STAB PWR

ad. Make sure the following circuit breakers are pushed in on NO. 1 AC PRI BUS:

(1) NO. 1 CONVERTER

(2) AC ESNTL BUS SPLY

ae. Make sure the following circuit breakers are pushed in on BATT BUS:

(1) BATT & ESNTL DC WARN EXT PWR CONTR

(2) ESNTL BUS AC & CONV WARN

af. Make sure BATT UTIL BUS - BATT BUS CONTR circuit breaker is pushed in.

11-17.3 REPLACE NO. 3 COLLECTIVE STICK POSITION SENSOR 11-17.3

ag. Disconnect electrical connector, P801, from No. 1 engine (PARA 4-2).

ah. Place the SERVO OFF switch on the pilot's and copilot's collective stick grips to CENTER position.

NOTE

Make sure NO. 1 DC PRI BUS-BACKUP PUMP PWR circuit breaker is pulled out if an external source of hydraulic power is used.

ai. Connect external hydraulic power or turn on backup pump (PARA 1-6.3).

aj. Connect digital multimeter to pins 29 and 30 on electrical connector, P801.

WARNING

Injury to personnel and damage to equipment will result if personnel or equipment interfere with movement of stabilator. Stabilator moves up and down during the following procedures. Do not allow personnel or equipment to interfere with stabilator.

ak. Place BOOST switch on STABILATOR/AUTO FLIGHT CONTROL PANEL to ON.

al. Place collective stick to full down position with feet off yaw control pedals.

am. Check resistance on multimeter. **MULTIMETER SHALL READ 1358 - 1442 OHMS.** If resistance is not 1358 - 1442 ohms, adjust No. 3 collective stick position sensor.

an. Loosen screw and nut securing lever to No. 3 collective stick position sensor shaft, if required.

ao. Rotate No. 3 collective stick position sensor shaft until multimeter reads 1358 - 1442 ohms.

ap. Tighten screw and nut securing lever to No. 3 collective stick position sensor shaft. Make sure multimeter reads 1358 - 1442 ohms after tightening screw and nut.

aq. Place collective stick to full up position.

ar. Check resistance on multimeter. **MULTIMETER SHALL READ 3650 - 4050 OHMS.** If resistance is not 3650 - 4050 ohms, repeat steps an. through ap.

as. Disconnect electrical connector, P800, from No. 2 engine (PARA 4-2).

at. Connect digital multimeter to pins 29 and 30 on electrical connector, P800.

au. Move collective stick from full up position to full down position, slowly. **MULTIMETER SHALL READ 3530 - 3930 OHMS AT FULL UP POSITION AND READ 1268 - 1352 OHMS AT FULL DOWN POSITION.** If resistance is not 3530 - 3930 ohms at full up position or 1268 - 1352 ohms at full down position, repeat steps an. through ap.

av. Disconnect multimeter.

aw. Turn off all electrical and hydraulic power.

ax. Connect the following electrical connectors:

(1) P801 to J801 on No. 1 engine (PARA 4-2).

(2) P800 to J800 on No. 2 engine (PARA 4-2).

ay. Install work platform and track assembly on mixer (PARA 2-43).

az. Check area for foreign objects and cleanness.

ba. Close main rotor pylon sliding cover.

best copy available

11-18 MIXER LINKS, LEVER, BELLCRANK (AVIM) 11-18

PARAGRAPH BREAKDOWN

11-18.1	REPLACE LINK BEARINGS (AVIM)
11-18.2	DISASSEMBLE/ASSEMBLE SMALL LINK FROM BELLCRANK (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68D - Aircraft Powertrain Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 7, Appendix D
- Aliphatic Polyurethane Coating, Item 114, Appendix D
- Cheesecloth, Item 98, Appendix D
- Cotton-Tipped Applicator, Item 84, Appendix D
- Degreasing Solvent, Item 131, Appendix D
- Epoxy Primer, Item 150, Appendix D
- Masking Tape, Item 228, Appendix D
- Paint Remover, Item 255, Appendix D
- Retaining Compound, Item 283, Appendix D
- Surface Primer, Grade T, Item 333, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Arbor Press, OO-P-636
- Dial Indicator, MIL-I-18422
- Fluorescent Penetrant Inspection Kit, XMA101
- Powertrain Repairer's Toolkit, SC 5180-99-CL-A13
- Staking Tool, T-34214
- Torque Wrench, 0-16 in. oz, TQSSD08A
- Vernier Caliper, GGG-C-111

REFERENCES

- TM 55-1500-204-25/1
- TM 55-1500-322-24
- TM 55-1500-335-23

11-18.1 REPLACE LINK BEARINGS (AVIM) 11-18.1

INSPECT

a. Inspect link bearings using dial indicator (TM 55-1500-204-25/1). **MAXIUMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

b. Check all bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). Replace worn or damaged bearings.

c. Clean parts, except bearings, with degreasing solvent, Item 131, Appendix D. Blow dry with dry compressed air.

d. Using paint remover, Item 255, Appendix D, remove paint from link.

e. Check suspected cracks with fluorescent penetrant inspection kit (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

f. Inspect for loose bearings, corrosion, and damage. **REPLACE LINK IF CORROSION EXCEEDS 0.010 INCH.**

g. Inspect for scratches and nicks. **REPLACE LINK IF NICKS OR SCRATCHES EXCEED 0.030 INCH.**

REPAIR

h. Using aluminum oxide abrasive cloth, Item 7, Appendix D, blend out any scratches, nicks, or corrosion within damage limits.

BEARING REPLACEMENT

i. Replace small link bearings, MKSP3L-A1173, and large link bearings, SA4-14A1-504, as follows:

(1) Support link. Press out old bearing with an arbor press and a suitable mandrel (TM 55-1500-204-25/1).

(2) Remove all old retaining compound from link bore with aluminum oxide abrasive cloth, Item 7, Appendix D.

(3) Measure small link bore using vernier caliper. **REPLACE LINK IF BORE IS GREATER THAN 0.6244 INCH.**

(4) Measure large link bore using vernier caliper. **REPLACE LINK IF BORE IS GREATER THAN 0.9008 INCH.**

(5) Remove all sanding dust and oil from replacement bearing OD and link bore with cheesecloth, Item 98, Appendix D, moistened with degreasing solvent, Item 131, Appendix D. Turn or replace cloth after each wipe. Do not touch treated surface. Turn or replace cloth as needed until cloth remains clean after last wipe.

NOTE

Surface primer and retaining compound must be made by same manufacturer. Dipping a brush, swab, or other tool into primer or retaining compound containers will contaminate all of the material in the container. To avoid contamination, pour material onto brush or swab as needed.

(6) Apply a thin coat of surface primer, Item 333, Appendix D, to link bore with a clean cotton-tipped swab. A break or bird's-eye in wet primer indicates a contaminated base surface. Reclean and reprime contaminated work.

(7) Allow primer coat to dry undisturbed for 15 -30 minutes. Do not touch primed surface.

11-18.1 REPLACE LINK BEARINGS (AVIM) 11-18.1

(8) Use a clean cotton-tipped swab to cover bearing OD and link bore surfaces with retaining compound, Item 283, Appendix D. Press bearing into link bore within 4 minutes of retaining compound application. **IF BEARING IS NOT INSTALLED WITHIN 4 MINUTES, DO ENTIRE CLEANING, PRIMING, AND RETAINING COMPOUND APPLICATION AGAIN.**

NOTE

Retaining compound squeeze out will not dry.

j. Dry bearing installation for a minimum of 24 hours at room temperature. Wipe away compound squeeze out using a clean cloth dampened with degreasing solvent, Item 131, Appendix D. Be careful not to get solvent in bearings.

k. Do a bearing rotational drag check as follows:

(1) Install suitable bolt, washers, and nut through bearing.

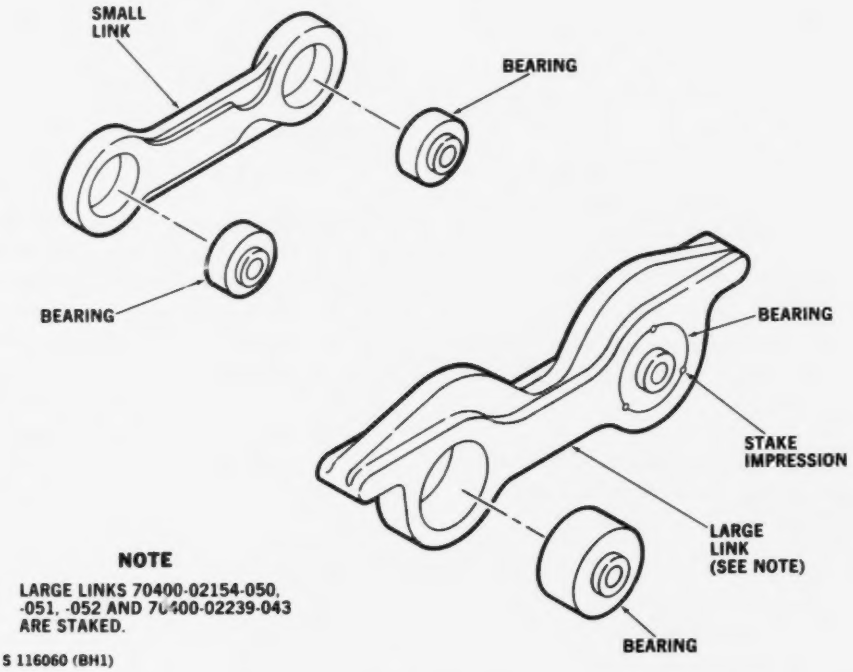
(2) Turn bearing inner race with torque wrench and socket. Measure torque needed to get inner race to turn. **REPLACE BEARING IF DRAG IS GREATER THAN 2 INCH-OUNCES.**

l. Three-point impression stake bearings on links 70400-02154-050, -051, -052 and 70400-02239-043 (Figure 11-76).

m. Mask bearings with masking tape, Item 228, Appendix D.

n. Apply one coat of epoxy primer, Item 150, Appendix D, to link.

o. Apply two coats of aliphatic polyurethane coating, Item 114, Appendix D, to link.



NOTE

LARGE LINKS 70400-02154-050, -051, -052 AND 70400-02239-043 ARE STAKED.

FIGURE 11-76

11-18.2 DISASSEMBLE/ASSEMBLE SMALL LINK FROM BELLCRANK (AVIM) 11-18.2

DISASSEMBLE

a. Remove lockbolt to separate small link from lever (TM 55-1500-204-25/1).

b. To replace small link bearings, refer to PARA 11-18.1.

INSPECT

c. Inspect lever bearings with dial indicator (TM 55-1500-204-25/1). **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

d. Inspect lever bushings, NAS538-3P9 and SS4045-3P18 using vernier caliper. **INSIDE RADIAL DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.1900-INCH ID.**

e. Inspect bellcrank bushings, NAS538-3P9 and SS4045-2P19 using vernier caliper. **INSIDE RADIAL DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.2005-INCH ID.**

f. Inspect lever bushings, NAS537-4P86 and NAS538-4P9 using vernier caliper. Inspect bellcrank bushings, NAS537-4P86 and NAS538-4P11 using vernier caliper. **INSIDE RADIAL DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.2505-INCH ID.**

g. Check all bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). Replace lever if necessary.

h. Inspect for loose bushings, corrosion, and damage to lever. **REPLACE LEVER IF CORROSION EXCEEDS 0.010 INCH.**

i. Inspect for scratches, nicks, and dents. **REPLACE LEVER IF SCRATCHES AND NICKS EXCEED 0.030 INCH.**

j. Clean parts, except bearings, with degreasing solvent, Item 131, Appendix D. Blow dry with dry compressed air.

k. Using paint remover, Item 255, Appendix D, remove paint from lever. Check suspected cracks with fluorescent penetrant inspection kit, XMA101 (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

REPAIR

l. Using abrasive cloth, Item 7, Appendix D, blend out any scratches, nicks, or corrosion within damage limits.

m. Mask bearings and bushings with masking tape, Item 228, Appendix D.

n. Apply one coat of epoxy primer, Item 150, Appendix D, to lever.

o. Apply two coats of aliphatic polyurethane coating, Item 114, Appendix D, to lever.

ASSEMBLE

NOTE

Make sure collar is on opposite side of plain bushing.

p. On lever, 70400-02209-046, install small link, 70400-02232-045, with pin, NAS1446-11, washers, AN960KD10L, and collar, NAS1080C06 (Figure 11-77, Detail A).

q. On bellcrank, 70400-02212-046, install small link, 70400-02232-048, with pin, NAS1446-11, washers, AN960KD10L, and collar NAS1080C06 (Figure 11-77, Detail A).

11-18.2 DISASSEMBLE/ASSEMBLE SMALL LINK FROM BELLCRANK (AVIM) 11-18.2

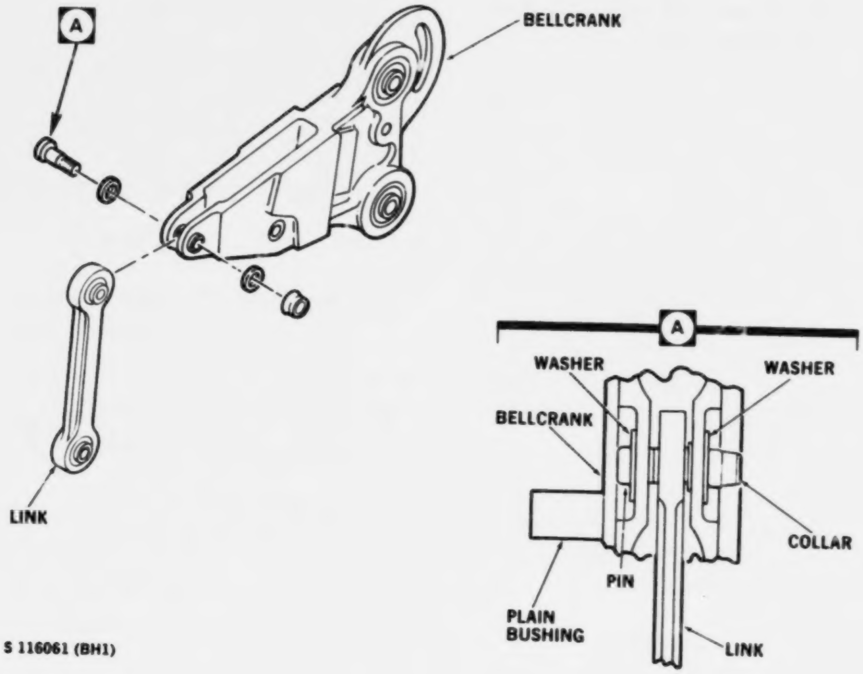

A
BELLCRANK
LINK
S 116061 (BH1)
A
WASHER
WASHER
BELLCRANK
COLLAR
PIN
PLAIN BUSHING
LINK

FIGURE 11-77

11-19 PRIMARY SERVO 11-19

PARAGRAPH BREAKDOWN

11-19.1 REPLACE PRIMARY SERVO
11-19.2 FOUR-POINT RIGGING CHECK
11-19.3 REPLACE PRESSURE SWITCH

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Alcohol, Item 72, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-155
- Cotter Pin, MS24665-374
- Hydraulic Fluid, Item 174, Appendix D
- Insulation Sleeving, Item 182, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, MS28778-6
- Packing, M83461/1-011
- Tiedown Straps, Item 370, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicator, MIL-I-18422
- Protractor, F7710
- Rigging Kit, 70700-20389-042
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 50 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686
- Torque Wrench, 700 - 1600 in. lbs, GGG-W-00686

REFERENCES

- PARA 2-63
- PARA 5-11
- PARA 7-2
- PARA 7-6
- PARA 11-2
- PARA 11-27
- TM 11-1520-237-23-2
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-19.1 REPLACE PRIMARY SERVO 11-19.1

REMOVE

a. Turn off all electrical and hydraulic power.

b. Open main rotor sliding cover.

c. If main rotor blades are installed, turn main rotor head to allow overhead clearance and make it easier to remove primary servo.

d. Do this step only if just one primary servo is being replaced.

CAUTION

To prevent overheating backup hydraulic system use this chart for limits when running backup pump:

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	–
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

(1) Pressurize backup hydraulic system with either external or APU power.

(2) Install rigging pins in four upper deck torque shafts (PARA 11-27).

(3) If main rotor blades are installed, install damper rigging block on red (#1) blade and secure with tiedown strap, Item 370, Appendix D. If blades are removed damper block is not required.

(4) Measure and record red (#1) blade angle at 0°, 90°, 180°, and 270° locations.

(5) Remove rigging pins from upper deck torque shafts. Turn off all electrical and hydraulic power.

e. Disconnect electrical connectors from primary servo being replaced.

INSPECT FOR PLAY

f. Before removing primary servo pushrods, inspect spherical bearing connections for radial and axial wear limits.

g. Move pushrods up and down, measuring radial play on surface of connecting pushrods, using dial indicator. **RADIAL PLAY SHOWN ON DIAL INDICATOR MUST NOT BE MORE THAN 0.020 INCH PER CONNECTION.** If play is more, replace part.

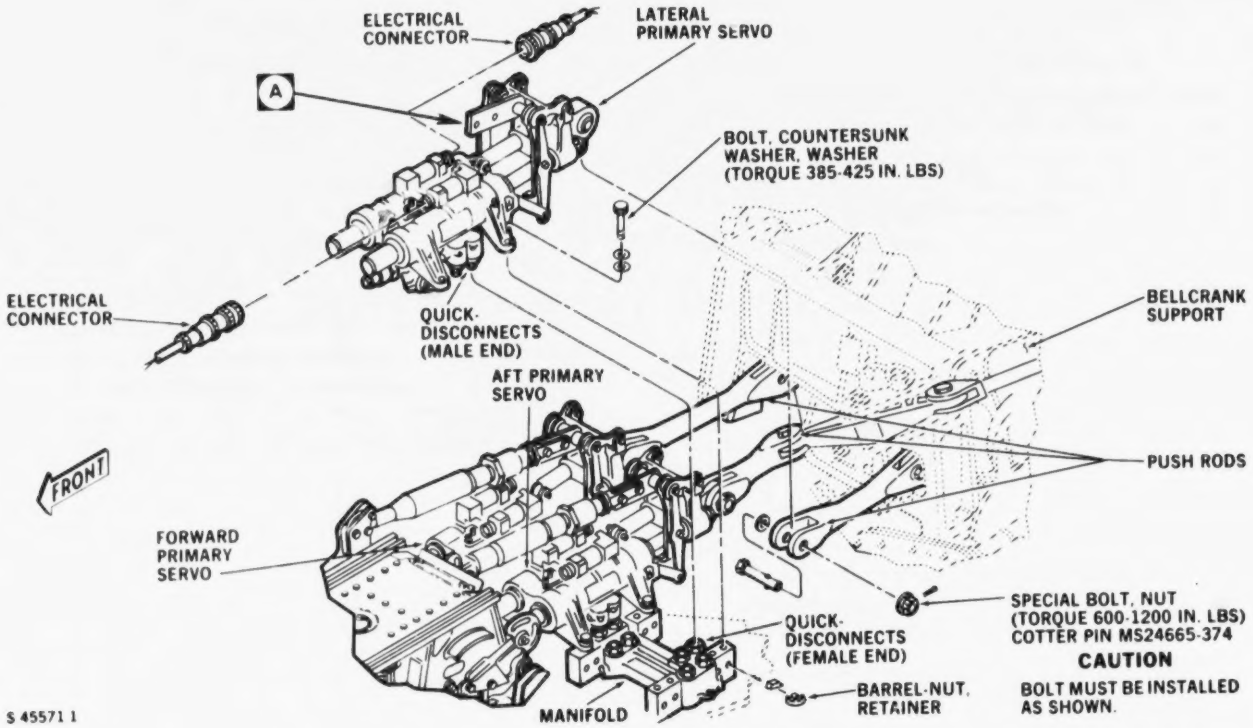
h. Move pushrods from side-to-side, measuring axial play on surface of connecting pushrods, using dial indicator. **AXIAL PLAY SHOWN ON DIAL INDICATOR MUST NOT BE MORE THAN 0.020 INCH PER CONNECTION.** If play is more, replace part.

i. To remove special bolt from large pushrods, first remove nut. Use a punch or pin with about a 3/16-inch-diameter end and push pin in bolthead. This will release retaining balls on threaded end of bolt so bolt can be removed.

j. Save retaining plates for installation on replacement servos, 70410-02820-044 through 70400-02820-053.

k. Unbolt and disconnect pushrod from output end of primary servo.

11-19.1 REPLACE PRIMARY SERVO 11-19.1


ELECTRICAL CONNECTOR
LATERAL PRIMARY SERVO
A
BOLT, COUNTERSUNK WASHER, WASHER (TORQUE 385-425 IN. LBS)
ELECTRICAL CONNECTOR
QUICK-DISCONNECTS (MALE END)
BELLCRANK SUPPORT
AFT PRIMARY SERVO
FRONT
PUSH RODS
FORWARD PRIMARY SERVO
SPECIAL BOLT, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
QUICK-DISCONNECTS (FEMALE END)
BARREL-NUT, RETAINER
MANIFOLD
S 45571 1

CAUTION

BOLT MUST BE INSTALLED AS SHOWN.

FIGURE 11-78 (SHEET 1 OF 2)

l. Measure and record exposed part of piston to nearest 1/64 inch.

m. Remove control rod between mixer and servo (PARA 11-27).

n. Remove primary servo holddown bolts and barrel nuts.

o. Lift primary servo straight up and carefully remove it from primary manifold. Quick-disconnects will separate from one another.

o.1. Cover primary manifold quick-disconnects (female end), if replacement servo is not to be immediately installed.

INSPECT

NOTE

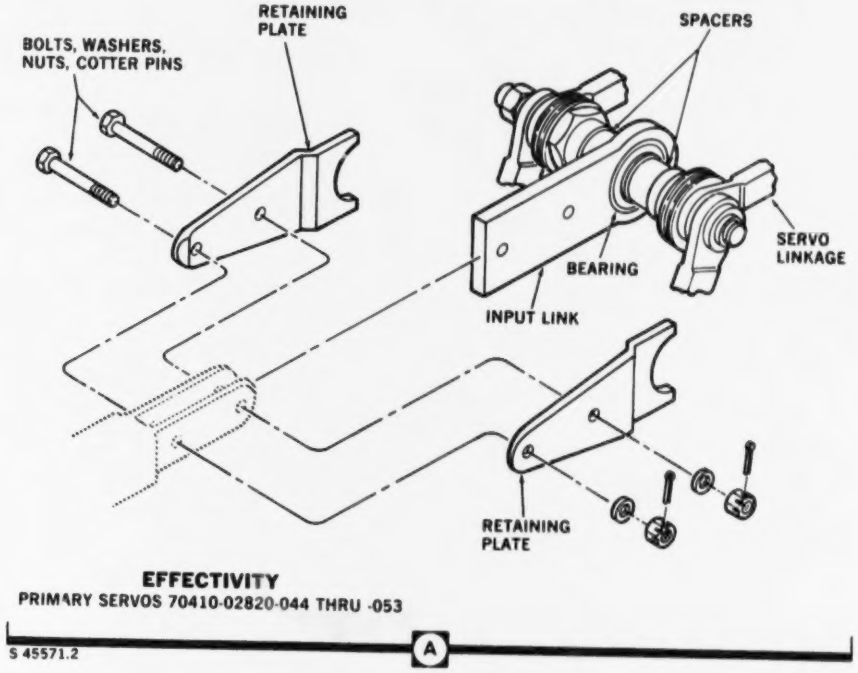
Surface discoloration on primary servo housing is not a cause for replacement.

p. On servos 70410-02820-044 through 70410-02820-053, check servo input link bearing spacers (Figure 11-78, Detail A) for grooves or gouges. **DAMAGE SHALL NOT BE MORE THAN 0.0626 INCH DEEP.** If damaged beyond limit, replace servo.

q. Check for evidence of scraper ring displacement. If ring is displaced, check for seal leakage (PARA 7-2). If leakage criteria is not met, replace servo.

r. If scraper ring is completely detached from housing, remove scraper ring. Check for seal leakage (PARA 7-2). If leakage criteria is not met replace servo.

11-19.1 REPLACE PRIMARY SERVO 11-19.1



EFFECTIVITY
PRIMARY SERVOS 70410-02820-044 THRU -053

FIGURE 11-78 (SHEET 2 OF 2)

INSTALL

CAUTION

To keep from scratching either output rod end, or pistons, make sure surface you push servo against is covered with a soft pad, such as rubber or cloth.

s. Adjust piston of replacement servo to measurement recorded from removed servo by holding servo vertically by cylinders, and pushing either piston end or rod end against a padded, flat surface.

t. Uncover primary manifold quick-disconnects. Be sure they are clean. Wipe with clean rags and flush with alcohol, Item 72, Appendix D.

u. Line up primary servo quick-disconnects, and push servo down until four feet contact servo beam fitting. Hold this position until bolts are torqued down.

CAUTION

Damage to frame or beam will occur if barrel nut is incorrectly installed. To prevent damage make sure barrel nut is installed with barrel (round side) towards bolthead.

NOTE

Use only RMLH 2577-064 barrel nuts stamped EN on one side.

v. Install barrel nuts in servo beam fitting.

w. Install countersunk washers on bolts, with countersunk side toward head. Install flat washers on bolts.

11-19.1 REPLACE PRIMARY SERVO 11-19.1

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of bolts are critical characteristics.

x. Install holddown bolts. Torque four bolts down evenly, one turn at a time, to avoid cocking servo and possibly damaging disconnect couplings. **TORQUE DIAGONALLY OPPOSITE BOLTS TO 385 - 425 INCH-POUNDS UNTIL ALL FOUR ARE FINALLY TORQUED.**

y. Lockwire, Item 199, Appendix D, boltheads as follows:

(1) Front and rear bolts right side of forward primary servo - to each other.

(2) Front and rear bolts left side of lateral primary servo - to each other.

(3) All other bolts - to primary servo holddown bolt next to it.

(4) Apply slippage mark to all boltheads.

(5) Cover lockwire with insulation sleeving, Item 182, Appendix D.

z. Install control rod between mixer and primary servo input (PARA 11-27).

CAUTION

To prevent interference between bolt, and brace on transmission, bolt must be installed with head toward right side of helicopter.

aa. Connect output end of primary servo piston rods to pushrods with special bolt, washer, and nut. Push in pin, in head of special bolt, to release retaining balls. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

ab. Connect electrical connectors to pressure switches as follows:

On forward primary servo, connect
P426 to 1st stage pressure switch
P429 to 2nd stage pressure switch
On aft primary servo, connect
P425 to 1st stage pressure switch
P428 to 2nd stage pressure switch
On lateral primary servo, connect
P424 to 1st stage pressure switch
P427 to 2nd stage pressure switch

ADJUST

NOTE

- Use these procedures only if one servo is to be replaced.
- Make sure rigging pins are installed in all upper deck torque shafts.

ac. If either foreward or aft primary servo (but not both) was replaced, do this:

(1) Calculate difference between 90° and 270° readings made before servo was removed.

11-19.1 REPLACE PRIMARY SERVO 11-19.1

NOTE

This difference is the sum of two readings, but ignoring the negative sign for the 270° reading.

Example

90°	270°
+12.2	-9.5

Add 12.2° and 9.5° = 21.7°

(2) Measure red blade angle at 90° and 270° positions. **THE DIFFERENCE BETWEEN THESE READINGS MUST BE WITHIN ± 0.25° OF DIFFERENCE IN READINGS MADE BEFORE SERVO WAS REMOVED.**

(3) Adjust servo input control rod as necessary to make differences between readings same.

ad. If lateral primary servo was replaced, do this:

(1) Calculate difference between 0° and 180° readings made before servo was removed.

NOTE

This difference is the sum of two readings, but ignoring the negative sign for the 130° reading.

Example

0°	180°
+1.9°	-1.1°

Add 1.9° and 1.1° = 3.0°

(2) Measure red blade angle at 0° and 180° positions. **THE DIFFERENCE BETWEEN THESE READINGS MUST BE WITHIN ± 0.25° OF DIFFERENCE IN READINGS MADE BEFORE SERVO WAS REMOVED.**

(3) Adjust servo input control rod as necessary to make differences between reading same.

ae. If two or three primary servos have been replaced, do a four-point rigging check (PARA 11-19.2).

af. Remove rigging pins and damper block(s).

ag. Remove external hydraulic and electrical power.

ah. Do an operational check (TM 55-1520-237-T).

ai. Make sure area is clean and free of foreign material.

aj. Close main rotor pylon sliding cover.

ak. Do a maintenance test flight (TM 55-1520-237-MTF).

11-19.2 FOUR-POINT RIGGING CHECK 11-19.2

NOTE

This step is used to check main rotor rigging after replacing two or three primary servos at the same time. Helicopter must be rigged with blade track/autorotation adjustments made. If helicopter is not rigged complete with blade track/autorotaiion adjustments, rig per PARA 11-2.

CHECK RIGGING

a. Remove main rotor pylon sliding cover.

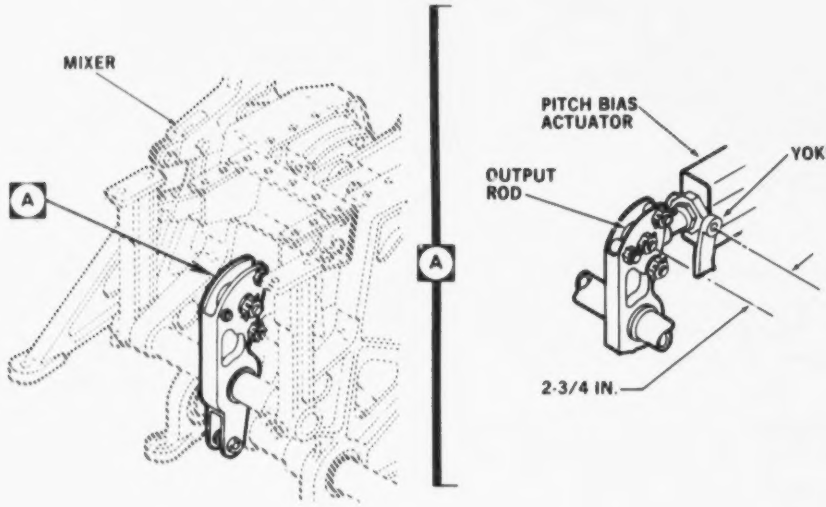
b. Remove work platform on mixer.

c. Unzip pilot's and copilot's cyclic stick boots.

d. On helicopters with pitch bias actuator check to be sure pitch bias actuator is at midstroke (2-3/4 inches from center of yoke to center of output rod end). If pitch bias actuator is not at midstroke remove it and install yaw/pitch coupling link (PARA 2-63).

e. Turn off electrical power.

f. Pressurize backup hydraulic system (PARA 7-2).



MEASURING PITCH BIAS ACTUATOR FOR NEUTRAL POSITION

S 45467.5 (B)

FIGURE 11-79

11-19.2 FOUR-POINT RIGGING CHECK 11-19.2

WARNING

- Moving controls while installing rigging pins may cause personal injury or damage to equipment.
- Do not move controls while installing rigging pins or tool. If rigging holes do not line up, remove pin or tool completely, then move controls or adjust control rods to line up rigging holes.

g. Install pins, 70700-20380-043, (5/16 x 4 in.) in pitch, roll, and yaw upper torque shafts (forward of boost servos).

h. Apply main rotor gust lock to hold rotor head. Install damper rigging blocks on red (#1) blade and hold with tiedown straps, Item 370, Appendix D. Release gust lock.

i. Turn main rotor head until black index marks on swashplates line up and No. 1 pitch control rod is over front and rear input (90°) position.

NOTE

If index marks on swashplate bearing retaining rings are missing, or cannot be matched, flight control rigging cannot be done. Align index marks (PARA 5-11).

j. Use Main Rotor Rigging Worksheet to record readings (PARA 11-2).

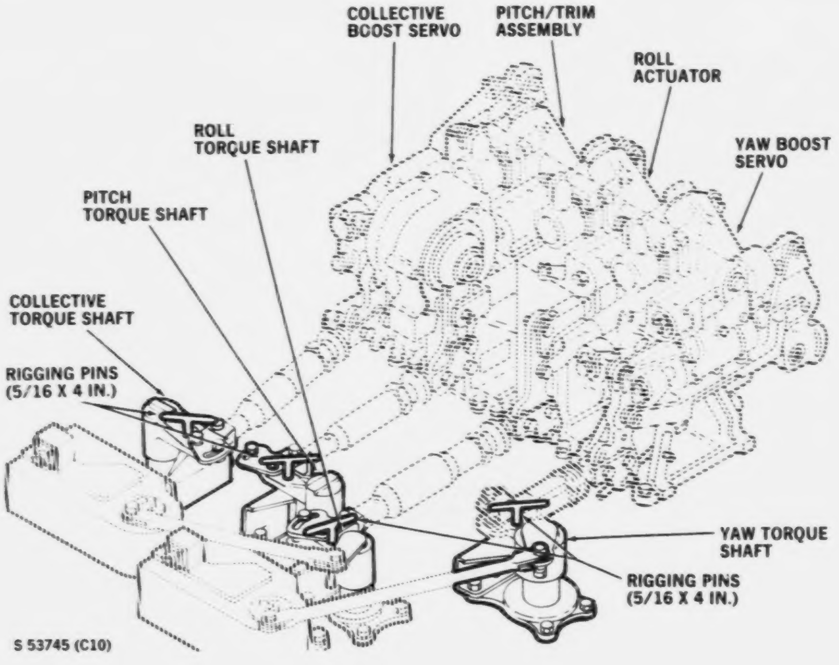

COLLECTIVE BOOST SERVO
PITCH/TRIM ASSEMBLY
ROLL ACTUATOR
YAW BOOST SERVO
ROLL TORQUE SHAFT
PITCH TORQUE SHAFT
COLLECTIVE TORQUE SHAFT
RIGGING PINS (5/16 X 4 IN.)
YAW TORQUE SHAFT
RIGGING PINS (5/16 X 4 IN.)
S 53745 (C10)

FIGURE 11-80

11-19.2 FOUR-POINT RIGGING CHECK 11-19.2

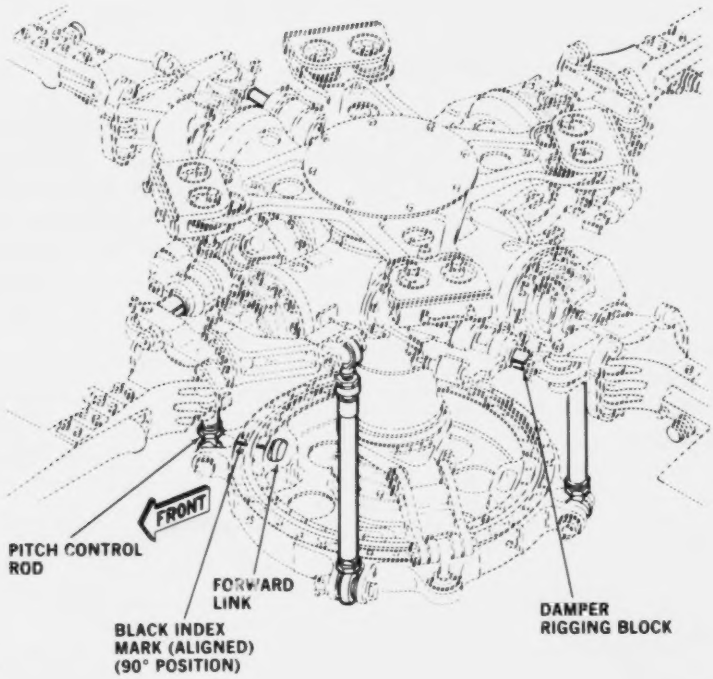


FIGURE 11-81

CHECK COLLECTIVE ANGLES

WARNING

To avoid injury to personnel and damage to equipment, do an autorotation and high collective stop flight check to complete this rig check.

NOTE

Cycle collective at least 3 times before taking collective pitch reading.

k. With collective stick held in low pitch position, measure blade angle of #1 (red) blade, as blade is positioned at 90°, 180°, 270°, and 0° locations. **AVERAGE SHOULD BE 0.0° to 1.0°.**

l. With collective stick in high pitch position, measure blade angle of #1 (red) blade as blade is positioned at 90°, 180°, 270°, and 0° locations. **AVERAGE SHOULD BE 15.5° TO 17.5° GREATER THAN LOW PITCH AVERAGE.** Check that swashplate ball does not extend beyond transmission guide more than 0.250 inch.

m. If low and high collective pitch averages are not within limits, or if swashplate extends beyond transmission guide too much, do a main rotor rig/check (PARA 11-2).

CHECK LONGITUDINAL ANGLES

n. Remove rigging pin from pitch torque shaft.

o. While holding collective pitch stick at high pitch stop, move cyclic stick forward. Measure blade angle at 90° and 270° location. **DIFFERENCE BETWEEN BOTH READINGS MUST BE 33.0° OR GREATER, AND PITCH FORWARD LIMITER ROLLER CANNOT BE FREELY TURNED** (Figure 11-82).

p. If forward limiter is bottomed and roller cannot be turned, but blade angle difference is less than 33.0°, do this adjustment:

Shorten forward primary servo pushrod by turning barrel to right, while facing aft and lengthen aft primary servo pushrod by turning barrel to left, same amount, while facing aft. Do this adjustment until difference between both readings is not less than 33.0° at high collective/forward stick.

q. While holding high collective, move cyclic stick full aft with red (#1) blade at 90° location and at 270° location. Read blade angles for both locations. **DIFFERENCE BETWEEN 90° AND 270° READINGS MUST BE 17° OR GREATER.** If necessary, adjust cyclic pitch stick rear stop until you have this reading. If adjustment on cyclic stick rear stop is not enough, adjust as follows:

Lengthen input pitch control rod to pitch/trim assembly (Figure 11-80) until you have this reading. Adjust copilot's cyclic stick stop to match pilot's. Make certain copilot's stop is not contacted first.

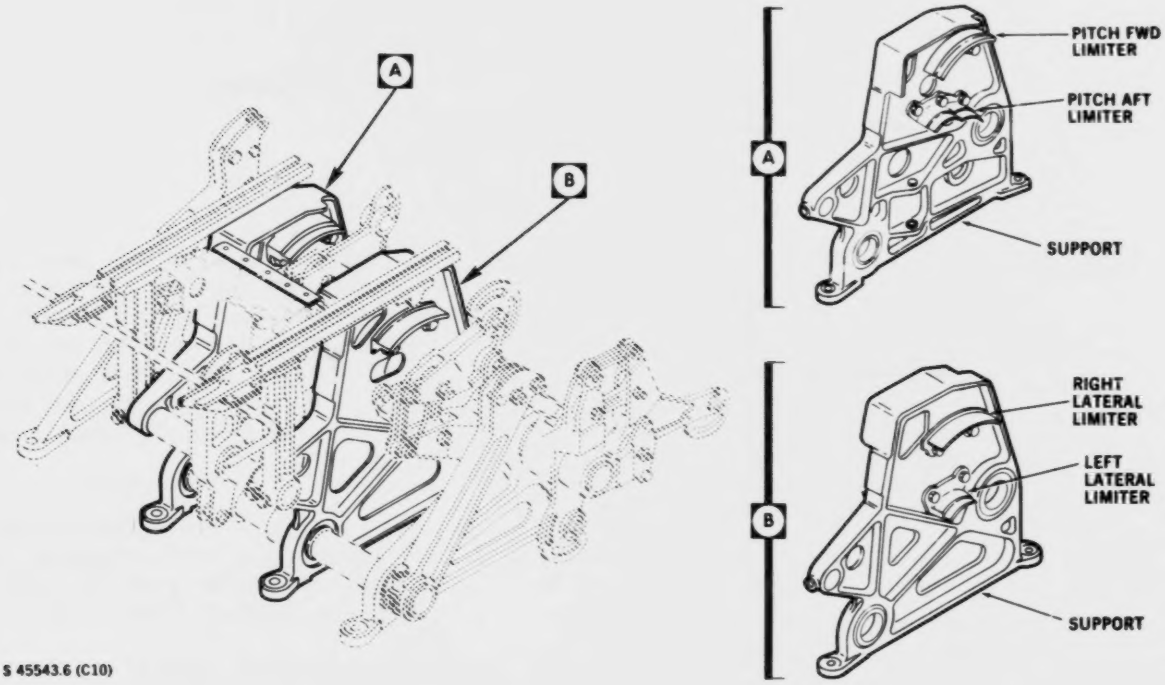


FIGURE 11-82

11-19.2 FOUR-POINT RIGGING CHECK 11-19.2

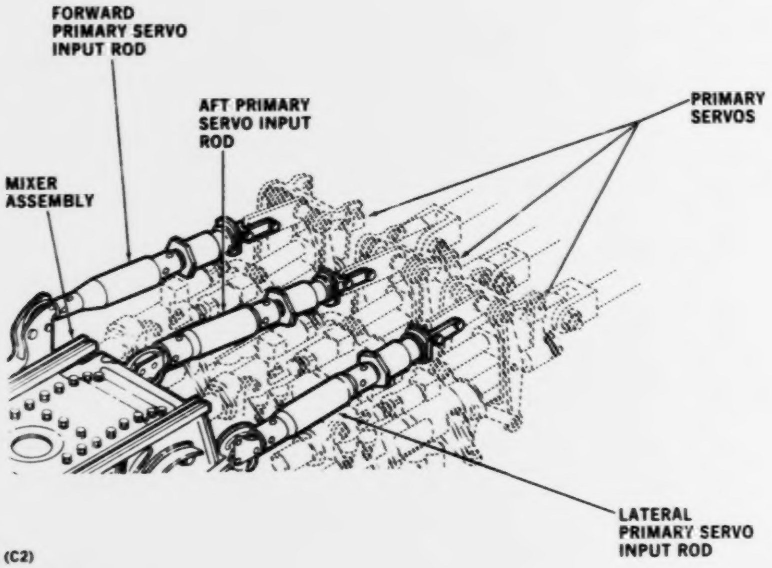

FORWARD PRIMARY SERVO INPUT ROD
AFT PRIMARY SERVO INPUT ROD
PRIMARY SERVOS
MIXER ASSEMBLY
LATERAL PRIMARY SERVO INPUT ROD
S 53751 (C2)

FIGURE 11-83

r. If you have adjusted any stops or control rods, recheck high collective forward stick readings at 90° and 270° to be sure 33.0° is maintained.

CHECK LATERAL ANGLES

s. Move pilot's collective pitch stick to full low pitch position and hold in place.

t. Remove rigging pin from roll torque shaft, and reinstall (5/16 x 4 in.) pin in pitch torque shaft.

u. Move cyclic stick full left until roller contacts lateral left limiter in mixer. **CHECK FOR 0.010-TO 0.030-INCH CLEARANCE BETWEEN CYCLIC STICK AND STOP.** Move red blade to 180° and 0° locations and measure blade angle at both locations. Left lateral cyclic range is found by adding 180° reading to 0° reading, ignoring that this reading is negative. **SUM OF BOTH READINGS SHOULD BE 15° TO 17°.** If sum is less than 15°, adjust lateral primary servo input control rod as follows:

Shorten lateral primary servo control rod by turning barrel to right while facing aft. Do this adjustment until total angle between 0° and 180° locations read 15° to 17°.

11-19.2 FOUR-POINT RIGGING CHECK 11-19.2

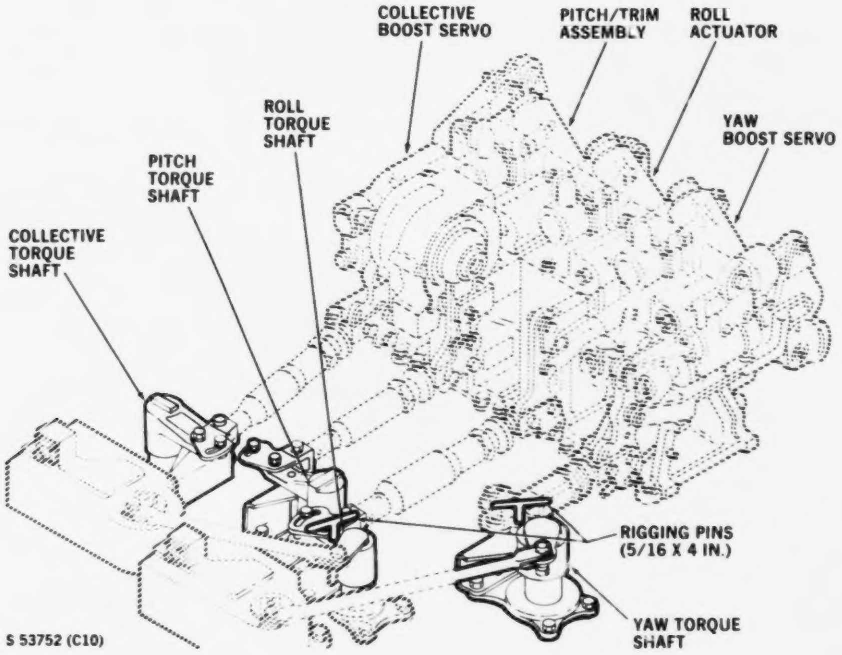

COLLECTIVE BOOST SERVO
PITCH/TRIM ASSEMBLY
ROLL ACTUATOR
ROLL TORQUE SHAFT
YAW BOOST SERVO
PITCH TORQUE SHAFT
COLLECTIVE TORQUE SHAFT
RIGGING PINS (5/16 X 4 IN.)
YAW TORQUE SHAFT
S 53752 (C10)

FIGURE 11-84

v. Move cyclic stick full right until roller contacts lateral right limiter in mixer. **CHECK FOR 0.010- TO 0.030-INCH CLEARANCE BETWEEN CYCLIC STICK AND STOP.** Move red blade to 180° and 0° locations and measure blade angle at both locations. Add 0° reading to 180° reading, ignoring that this reading is negative. **SUM OF THESE TWO READINGS SHOULD BE 14° TO 16°.** If you cannot get this reading, adjust controls as follows:

(1) Lengthen lateral primary servo input control by turning barrel to left while facing aft. Do this adjustment until low right cyclic reading is between 7.0° and 8.0°.

(2) Check low left cyclic range again, to be sure it is still within range. Adjust lateral primary servo control rod until both lateral range requirements are satisfied.

11-19.2 FOUR-POINT RIGGING CHECK 11-19.2

QC CHECKS

w. Do the following QC checks:

  (1) No passage of 0.020-inch lockwire through control rod inspection holes.

  (2) Primary servo input rods for lockwire.

  (3) Control rods for lockwire.

  (4) Cotter pins installed in nuts where required.

  (5) Cyclic and collective stick stop bolts for lockwire.

  (6) All rigging pins and damper blocks removed.

x. Disconnect all hydraulic and electrical power.

y. Reset PLT VSI circuit breaker on No. 2 ac primary circuit breaker panel.

z. Zip up pilot's and copilot's stick boots.

aa. Check that area is clean and free from foreign objects before closing cover.

ab. Install work platform on mixer.

ac. Install main pylon sliding cover.

ad. Do a maintenance test flight of autorotational rpm and high collective stop (TM 55-1520-237-MTF).

11-19.3 REPLACE PRESSURE SWITCH 11-19.3

REMOVE

CAUTION

- To avoid getting dirt in components, make sure primary servo is clean before disassembly. Have replacement switch ready for installation before old switch is removed.
- To prevent equipment damage, use a wrench to hold pressure switch and servo adapter while removing switch.

a. Using wrench flats, unscrew pressure switch from servo.

b. Remove packings from pressure switch.

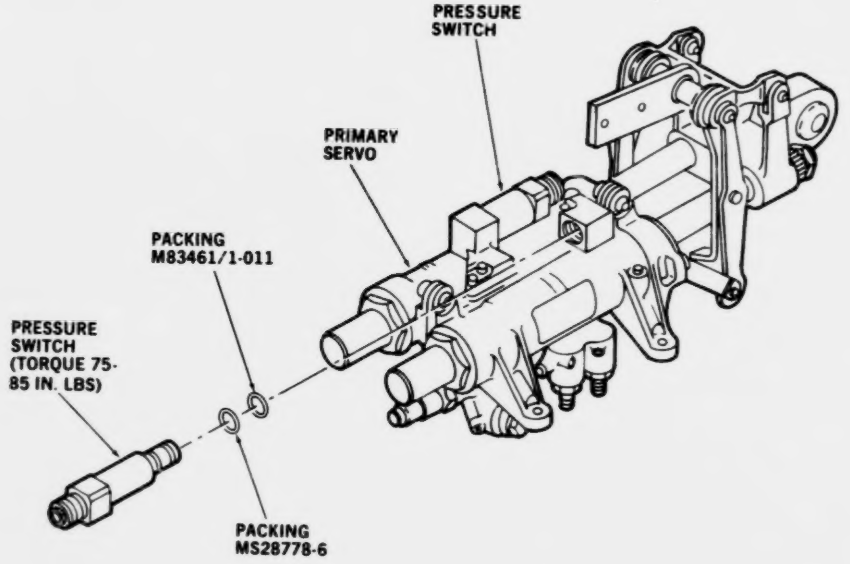
INSTALL

c. Coat packings and threads of pressure switch with hydraulic fluid, Item 174, Appendix D.

CAUTION

To prevent equipment damage, use a wrench to hold pressure switch and servo adapter while torquing.

d. Install packings, M83461/1-011 and MS28778-6 on pressure switch. Using wrench flats, screw switch in primary servo. **TORQUE PRESSURE SWITCH TO 75 - 85 INCH-POUNDS.** Lockwire, Item 199, Appendix D, pressure switch.


PRESSURE SWITCH
PRIMARY SERVO
PACKING M83461/1-011
PRESSURE SWITCH (TORQUE 75-85 IN. LBS)
PACKING MS28778-6

S 45551 (B)

FIGURE 11-85

11-20 UPPER DECK TORQUE SHAFTS AND LEVERS - REPLACE 11-20

PARAGRAPH BREAKDOWN

11-20.1	REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS
11-20.2	REPLACE PITCH TORQUE SHAFT AND LEVERS
11-20.3	REPLACE LATERAL TORQUE SHAFT AND LEVERS
11-20.4	REPLACE YAW TORQUE SHAFT AND LEVERS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Adhesive, Item 31, Appendix D
- Adhesive, Item 35, Appendix D
- Brush, Item 88, Appendix D
- Cotter Pin, MS24665-151
- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-170
- Cotter Pin, MS24665-172
- Machinery Towel, Item 227, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Primer, Item 272, Appendix D
- Primer, Item 274, Appendix D
- Sealing Compound, Item 312, Appendix D
- Trichloroethylene, Item 376, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicator, MIL-I-18422
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 50 in. lbs, GGG-W-00686

REFERENCES

- PARA 2-32
- PARA 11-1
- PARA 11-2
- PARA 11-21
- PARA 11-27

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

REMOVE

NOTE

Torque shaft and levers are a matched set. Parts cannot be replaced separately.

a. Turn off all electrical and hydraulic power.

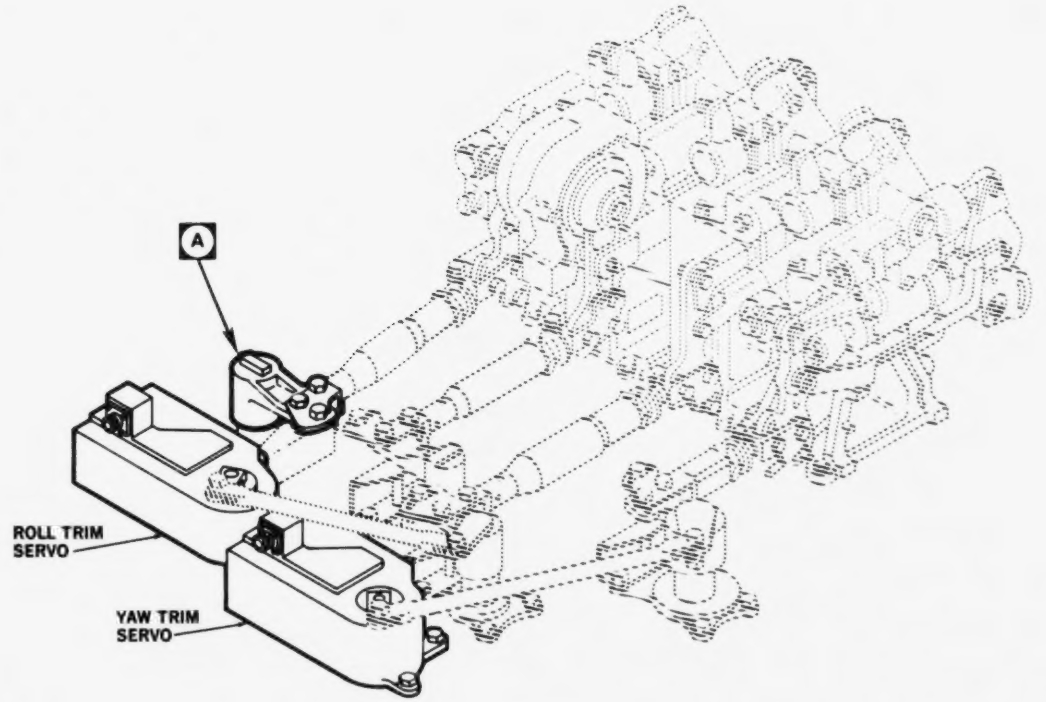
b. Open main rotor pylon sliding cover.

c. Unbolt input control rod from between collective torque shaft lever and collective boost servo (PARA 11-27).

d. Remove soundproofing from cabin overhead, station 247 to 265.

e. Disconnect control rods from lower lever (PARA 11-27).

f. Before removing balance spring, measure distance between end (shoulder) of adjusting rod and support. Record measurement.



S 45495.1 (BH4)

FIGURE 11-86 (SHEET 1 OF 3)

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

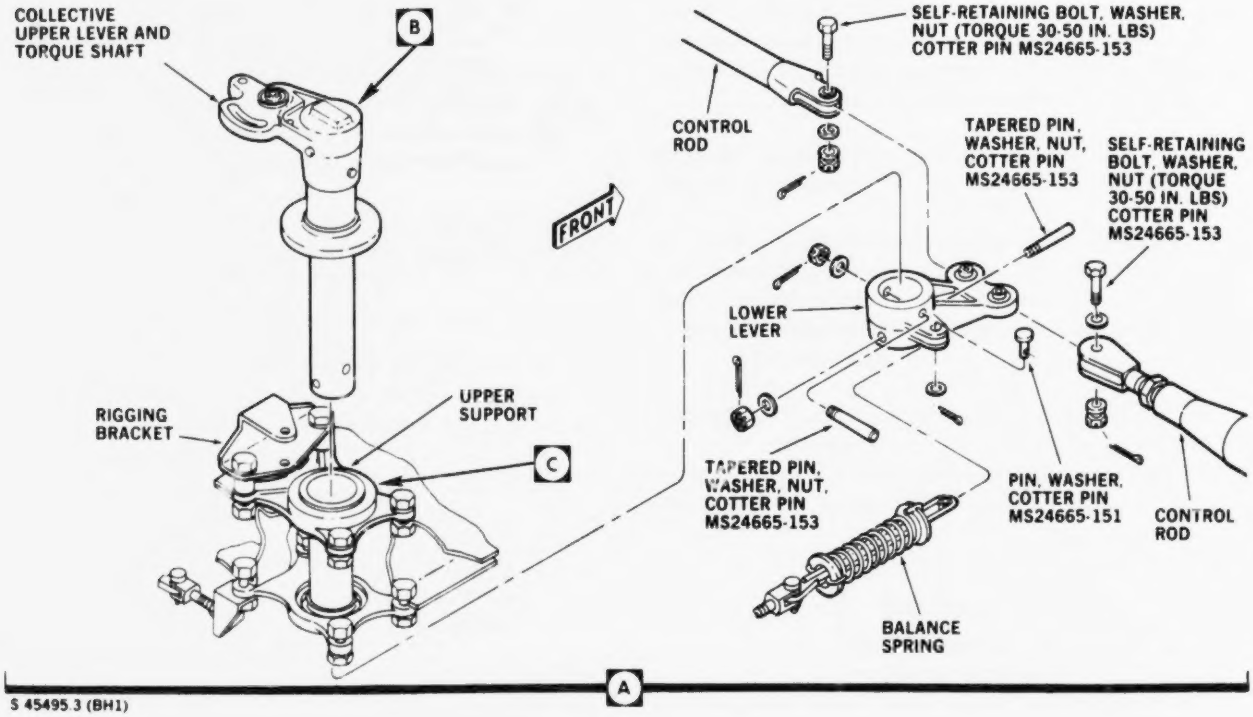

COLLECTIVE UPPER LEVER AND TORQUE SHAFT
B
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
FRONT
TAPERED PIN, WASHER, NUT, COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
LOWER LEVER
RIGGING BRACKET
UPPER SUPPORT
C
TAPERED PIN, WASHER, NUT, COTTER PIN MS24665-153
PIN, WASHER, COTTER PIN MS24665-151
CONTROL ROD
BALANCE SPRING
A
S 45495.3 (BH1)

FIGURE 11-86 (SHEET 2 OF 3)

g. At airframe support, loosen balance spring by backing off jamnut. Remove pin and disconnect balance spring from lower lever (Detail B).

CAUTION

Use a soft-head mallet when removing tapered pins so as not to damage threads. The tapered pins will be used on assembly unless torque shaft and levers are being replaced.

NOTE

Before removing tapered pins, mark one tapered pin and its hole to be sure pin is installed in same hole it was removed from.

h. Remove tapered pins and lower lever from torque shaft.

i. Remove torque shaft and upper lever from supports. Remove spacer and boot (Detail C).

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

j. At balance spring bracket bolted to lower support, measure distance between rod end (shoulder) of adjusting rod and bracket. Record measurement.

k. Loosen jamnut to remove tension from balance spring connected to pitch torque shaft lever.

l. Unbolt lower support, small laminated shim, large shims, and balance spring bracket from airframe. Remove lower support and spacer tube from airframe. Move bracket and balance spring aside.

m. Remove old adhesive from parts as follows:

(1) Remove adhesive from lower support, shims, and airframe using a nonmetallic scraper.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean remaining adhesive from mating surfaces with methyl ethyl ketone, Item 233, Appendix D.

n. Unbolt upper support and rigging bracket from airframe. Remove spacers.

o. Remove old adhesive from upper support, airframe, and washer as follows:

(1) Remove old adhesive from washer, upper support, and airframe using a nonmetallic scraper.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean remaining adhesive from mating surfaces with methyl ethyl ketone, Item 233, Appendix D.

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

INSPECT

p. Inspect tapered pin shank. Tapered surface must be smooth and free of damage, nicks, dents, scratches, or scuff marks. **NO REPAIR ALLOWED.** Replace damaged pin.

q. Inspect bearings, MKSP4A-A1173, or MKSP4A-400, in lower lever using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.0025 INCH.**

r. Inspect bearings, SA4-14A1-504, in collective upper lever and torque shaft using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

s. Inspect bearings, MKP21BS-A1173 or MKP21BS-400, in upper and lower support. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

INSTALL

t. Turn off all electrical and hydraulic power.

u. Install washers on flat mounting surfaces of upper support as follows:

(1) Apply a coat of sealing compound, Item 312, Appendix D, around mounting holes of upper support. Install washers on sealing compound.

(2) Clean extra sealing compound from holes in washers and support using methyl ethyl ketone, Item 233, Appendix D.

(3) Apply a light coat of sealing compound, Item 312, Appendix D, around holes on helicopter airframe and install upper support. Remove extra sealing compound from holes of airframe and support with methyl ethyl ketone, Item 233, Appendix D.

(4) Allow 24 hours for sealing compound to dry.

v. Install two bolts and washers in right mounting holes of upper support.

w. Place spacers and rigging bracket on left side of upper support. Face rigging hole in bracket toward center of support.

x. Install bolts and washers in rigging bracket and upper support. **TORQUE ALL BOLTS TO 105 - 115 INCH-POUNDS.**

y. Bond replacement boot to spacer as follows:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) If old bond is on spacer, clean with methyl ethyl ketone, Item 233, Appendix D, and wipe dry with clean cloth.

(2) Apply a coat of adhesive, Item 35, Appendix D, on one end of spacer, about as wide as boot collar. Apply a coat of adhesive on inside of boot collar.

(3) Allow adhesive to dry for at least 10 minutes.

(4) Apply a second coat of adhesive to mating surfaces and allow at least 10 minutes for it to dry.

(5) Slide boot on end of spacer and keep lower face of boot and end face of spacer flush. Press collar on boot against spacer all around to be sure of complete contact.

(6) Allow to dry for at least 8 hours.

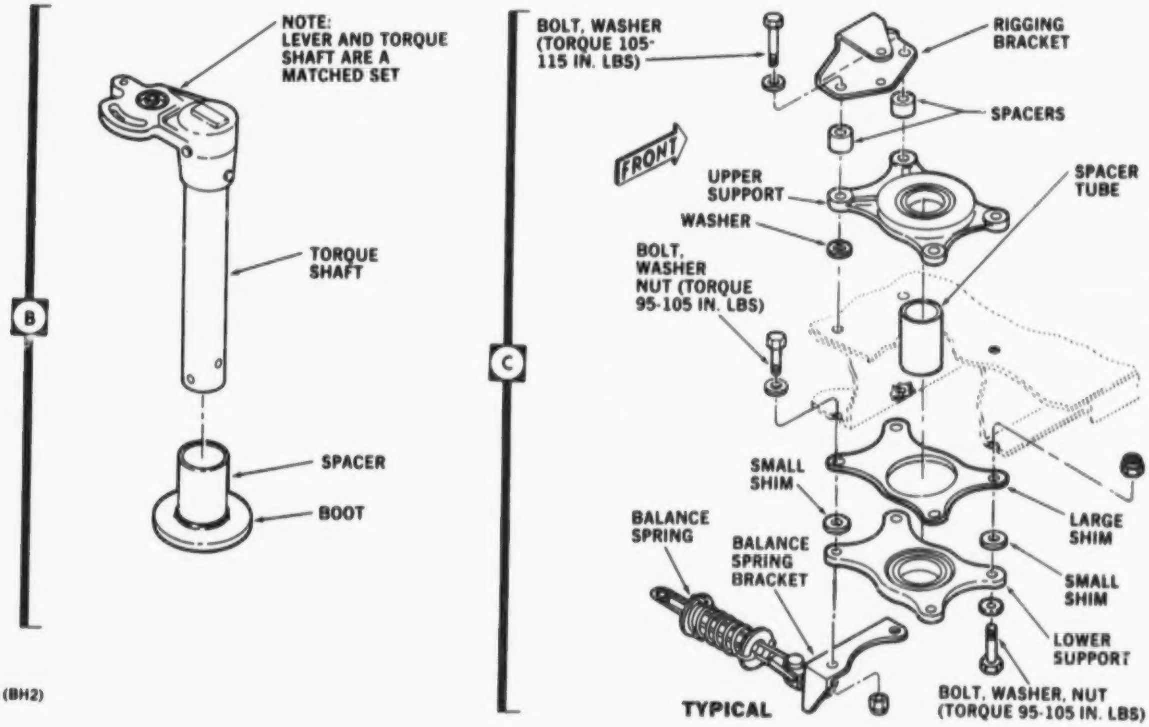

B
NOTE:
LEVER AND TORQUE SHAFT ARE A MATCHED SET
TORQUE SHAFT
SPACER
BOOT
S 45495.4 (BH2)
C
BOLT, WASHER (TORQUE 105-115 IN. LBS)
RIGGING BRACKET
SPACERS
FRONT
UPPER SUPPORT
SPACER TUBE
WASHER
BOLT, WASHER NUT (TORQUE 95-105 IN. LBS)
SMALL SHIM
LARGE SHIM
BALANCE SPRING
BALANCE SPRING BRACKET
SMALL SHIM
LOWER SUPPORT
TYPICAL
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)

FIGURE 11-86 (SHEET 3 OF 3)

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

z. Install spacer tube through opening in airframe.

aa. Install replacement lower support, flat side up, against airframe.

NOTE

- When torquing bolt installation, a minimum of one thin washer must be used under the bolthead. If torquing nut one thin washer must be used under nut.
- A maximum of three washers may be used under the bolthead or nut to make sure of proper bolt length.

ab. Install bolts (heads up), using a maximum of three washers in any combination.

ac. Install nuts and washer(s). **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** If torquing bolt, **TORQUE BOLT TO 104 - 116 INCH-POUNDS.**

CAUTION

To prevent damage to threads, use a soft-headed mallet to remove tapered pins.

ad. On replacement torque shaft, tap out tapered pins using a soft-headed mallet. Remove lower lever from torque shaft.

NOTE

Mark one tapered pin and its hole to be sure pin is installed in same hole from which it was removed.

ae. Install spacer and boot on torque shaft and slide shaft in upper and lower supports.

af. Install lower lever on torque shaft, line up tapered pin holes and install one tapered pin. Tap pin in to be sure it is fully seated. Do not install nut now.

NOTE

When measuring gap, make sure torque shaft turns freely.

ag. On upper deck, pull up on torque shaft and use a feeler gage to measure gap between upper lever and spacer. Record measurement.

ah. Remove tapered pin and remove lower lever from torque shaft. Remove torque shaft from supports.

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

ai. Unbolt and remove lower support and spacer tube from airframe.

NOTE

- When peeling laminated shims, allow for approximate thickness of adhesive used when installing shims and lower support.
- Use a combination of large and small shims to obtain measured gap.

aj. To shim torque shaft and levers on helicopters prior to Serial No. 83-23842, do this:

(1) **USE NO MORE THAN TWO LARGE SHIMS. TOTAL THICKNESS OF BOTH SHIMS MUST BE 0.100 INCH.**

(2) Peel small laminated shims to obtain measured gap. **MAXIMUM ALLOWABLE THICKNESS OF SHIMS IS 0.162 INCH. SHIMS MUST BE WITHIN 0.032 INCH OF EACH OTHER.**

(3) Apply a light coat of primer, Item 272, Appendix D, on airframe and on both sides of small and large shims. Allow primer to cure at 70° - 80°F (21° - 27°C) for 1 hour.

(4) Apply a light coat of adhesive, Item 31, Appendix D, to airframe and on side of large shim being installed on airframe. Install large shims on airframe.

(5) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes on large shim. Place small shims on large shims.

(6) Clean extra adhesive from holes in shims and airframe.

(7) Allow adhesive, Item 31, Appendix D, to cure for at least 2 hours at 110° - 130°F (44° - 54°C).

ak. To shim torque shaft and levers on helicopter Serial No. 83-23842 and subsequent, do this:

NOTE

If measurement taken in previous steps is 0.020 inch or less, shimming is not required.

(1) If measurement taken was 0.021 inch or more add small shims to obtain a maximum gap of 0.020 inch. Total thickness of shims shall be within 0.032 inch of each other.

(2) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes of lower support. Place shims on lower support.

(3) Clean extra adhesive from holes in shims and lower support.

(4) Allow adhesive, Item 31, Appendix D, to cure for at least 2 hours at 110° - 130°F (44° - 54°C).

al. Install spacer tube through opening and lower support, flat side up, against shims and install bolts (head up), washers, and nuts on right side of support. Do not torque nuts now.

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

am. Put balance spring bracket on support left mounting holes and install bolts (head up), washers, and nuts. **TORQUE ALL NUTS TO 95 - 105 INCH-POUNDS.**

an. Install torque shaft, with spacer and boot, in upper and lower support bearings.

NOTE

Record hole and tapered pin positions in shaft and lever before cleaning and priming.

ao. Install lower lever on torque shaft and line up tapered pin holes.

ap. Wipe holes and surrounding surfaces of all soil using dry machinery towel, Item 227, Appendix D.

aq. Clean holes, shaft, and lever using clean machinery towel, Item 227, Appendix D, wet with trichloroethylene solvent, Item 376, Appendix D. Wipe dry. Do not allow solvent to dry on parts.

ar. Apply two coats of epoxy primer, Item 274, Appendix D, to tapered pin holes in shaft and lever using brush, Item 88, Appendix D. Allow each coat to dry.

as. Apply a thin coat (0.002 - 0.003 inch) of sealing compound, Item 312, Appendix D, covering tapered pins. Use brush, Item 88, Appendix D.

at. Install tapered pins wet with sealing compound, into proper holes in shaft and lever.

NOTE

Small diameter end of tapered pin shank shall not extend more than 1/16 inch above lever surface. **REPLACE PIN TO OBTAIN CORRECT DIMENSION.**

au. Install washers and nuts ensuring that sealing compound is visible between pin surfaces, washers, and both sides of lever. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

av. Check that torque shaft turns freely in support bearings.

aw. Adjust pitch balance spring adjustable rod to measurement recorded when removed. Tighten jamnuts.

NOTE

If measurement is not known, adjust balance spring at the end of this task (PARA 11-21).

ax. Install balance spring between lever and bracket. Install pin, washer, and cotter pin, MS24665-151, in lever end and jamnut on adjustable end. Adjust balance spring rod to measurement recorded when removed. Tighten jamnuts (Figure 11-86, Sheet 2, Detail A).

11-20.1 REPLACE COLLECTIVE TORQUE SHAFT AND LEVERS 11-20.1

NOTE

If measurement is not known, adjust balance spring (PARA 11-21) after this task is done.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

ay. Connect control rods to lower lever.

az. Install self-retaining bolt and washers (under head) (PARA 11-1).

ba. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

bb. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bc. On upper deck, install input control rod between torque shaft lever and collective boost servo arm (PARA 11-27).

bd. If necessary, adjust balance spring (PARA 11-21).

be. Do a rigging check of collective flight control system (PARA 11-2).

bf. Check area for cleanness and foreign material.

bg. Install soundproofing in cabin overhead.

bh. Close main pylon rotor pylon sliding cover.

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

REMOVE

NOTE

Torque shaft and levers are a matched set. Parts cannot be replaced separately.

a. Turn off all electric hydraulic power.

b. Open main rotor pylon sliding cover.

c. Unbolt input control rod from between pitch torque shaft lever and pitch/trim assembly arm (PARA 11-27).

d. Remove soundproofing from cabin overhead, station 247 to 265 (PARA 2-32).

e. If necessary, disconnect control rods from pitch lever (Detail B).

f. Unbolt pitch link from pitch lever and torque shaft lower lever.

g. Before removing balance spring, measure distance between end (shoulder) of adjusting rod and bracket. Record measurement.

h. Loosen balance spring by backing off jamnut. Remove pin and disconnect balance spring from lower lever (Detail B).

CAUTION

Use a soft-headed mallet when removing tapered pin so as not to damage threads. The tapered pins will be used on assembly.

i. Remove tapered pins and remove lower lever from torque shaft (Detail C).

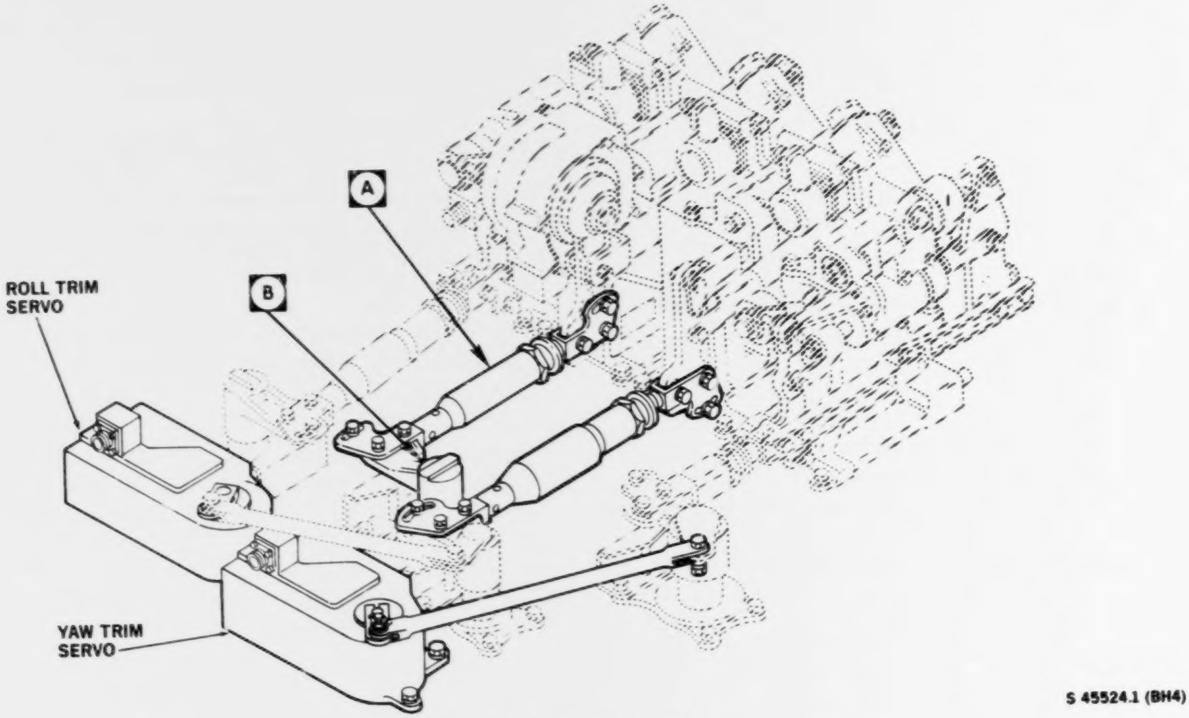


FIGURE 11-87 (SHEET 1 OF 3)

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

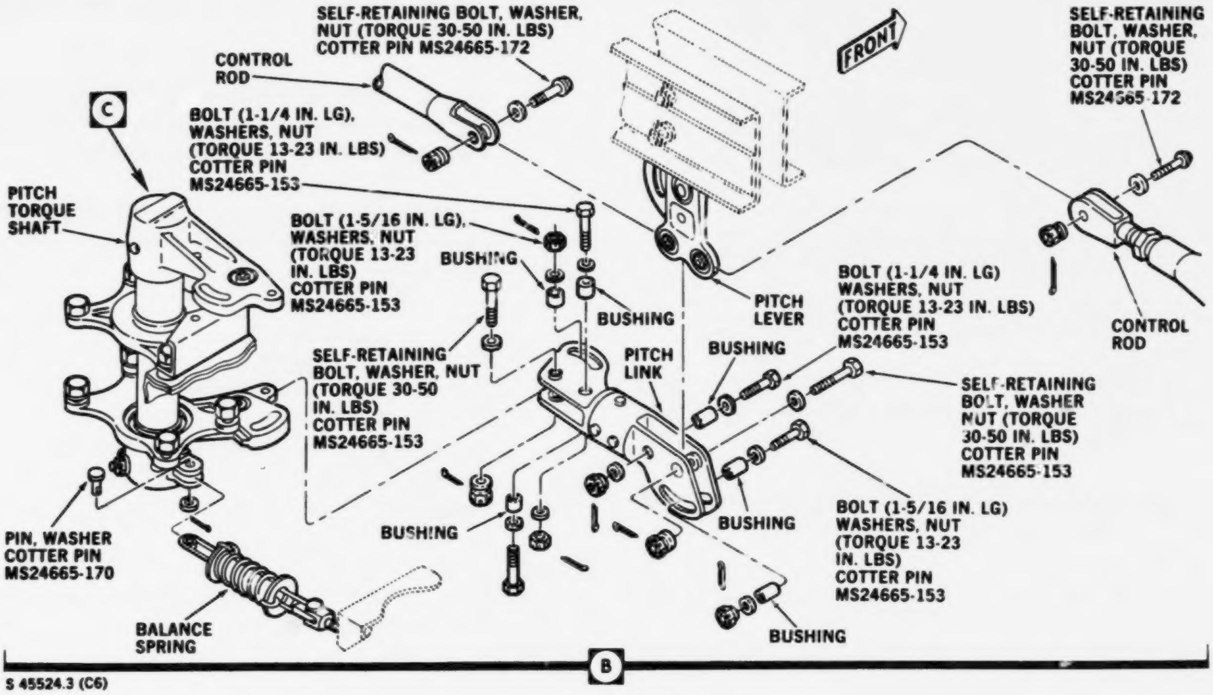

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-172
CONTROL ROD
C
BOLT (1-1/4 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
PITCH TORQUE SHAFT
BOLT (1-5/16 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
BUSHING
BUSHING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PITCH LINK
FRONT
PITCH LEVER
BUSHING
BOLT (1-1/4 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-172
CONTROL ROD
SELF-RETAINING BOLT, WASHER NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PIN, WASHER COTTER PIN MS24665-170
BUSHING
BUSHING
BOLT (1-5/16 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
BALANCE SPRING
BUSHING
B
S 45524.3 (C6)

FIGURE 11-87 (SHEET 2 OF 3)

NOTE

Mark one tapered pin and its hole to be sure pin is installed in same hole it was removed from.

j. Remove torque shaft and upper lever from supports. Remove spacer and boot (Figure 11-87, Sheet 3, Detail D).

k. Unbolt lower support, laminated shim, shims, and balance spring bracket from airframe. Remove lower support and spacer tube from airframe. Move bracket and balance spring aside (Figure 11-87, Sheet 3, Detail E).

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

l. Remove adhesive from parts as follows:

(1) Remove adhesive from lower support, shims, and airframe using a nonmetallic scraper.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean remaining adhesive from mating surfaces with methyl ethyl ketone, Item 233, Appendix D.

m. Unbolt upper support, rigging bracket, and spacers from airframe.

n. Remove adhesive from upper support, airframe, and washer as follows:

(1) Remove adhesive from washer, upper support, and airframe using a nonmetallic scraper.

(2) Clean remaining adhesive from mating surfaces with methyl ethyl ketone, Item 233, Appendix D.

INSPECT

o. Inspect tapered pin shank. Tapered surface must be smooth and free of damage, nicks, dents, scratches, or scuff marks. **NO DAMAGE ALLOWED.** Replace damaged pin.

p. Inspect bearing, MDW4K-A1173 or MDW4K-400, bearing, SA4-14A1-504, and bearing, MKSP4A-A1173 or MKSP4A-400, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, MDW4K-A1173 OR MDW4K-400 IS 0.005 INCH. MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, SA4-14A1-504, IS 0.005 INCH. MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, MKSP4A-A1173 OR MKSP4A-400, IS 0.0025 INCH.**

q. Inspect bearing, SA4-14A1-504, in upper pitch lever and torque shaft and lower pitch lever using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

r. Inspect bearing, MKP21BS-A1173 or MKP21BS-400, in upper or lower support using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005-INCH.**

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

s. Turn off all electrical and hydraulic power.

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

t. Install washers on flat mounting surfaces of upper support as follows:

  (1) Apply a coat of sealing compound, Item 312, Appendix D, around mounting holes of upper support. Install washers on support.

  (2) Clean extra sealing compound from holes in washers and support using methyl ethyl ketone, Item 233, Appendix D.

  (3) Apply a light coat of sealing compound, Item 312, Appendix D, around holes on airframe and install upper support. Remove extra sealing compound from holes in airframe and support with methyl ethyl ketone, Item 233, Appendix D.

  (4) Allow sealing compound to dry for 24 hours or at temperatures of 150° - 180°F (66° - 82°C) for about 2 hours.

u. Install two bolts and washers in left mounting holes of upper support.

v. Place spacers and rigging bracket on right side of upper support. Face rigging hole in bracket toward center of support.

w. Install bolts and washers in rigging bracket and upper support. **TORQUE ALL BOLTS TO 105 - 115 INCH-POUNDS.**

x. Bond replacement boot to spacer as follows:

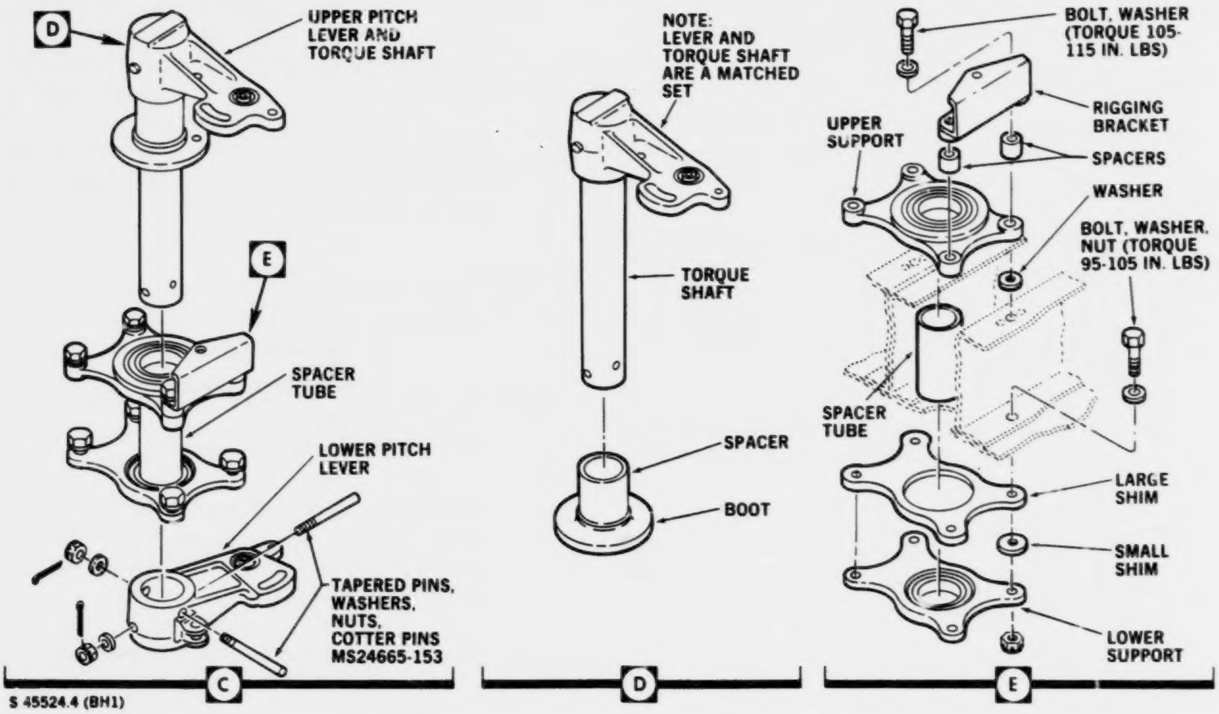

D
UPPER PITCH LEVER AND TORQUE SHAFT
E
SPACER TUBE
LOWER PITCH LEVER
TAPERED PINS, WASHERS, NUTS, COTTER PINS MS24665-153
C
S 45524.4 (BH1)
NOTE: LEVER AND TORQUE SHAFT ARE A MATCHED SET
TORQUE SHAFT
SPACER
BOOT
D
BOLT, WASHER (TORQUE 105-115 IN. LBS)
RIGGING BRACKET
UPPER SUPPORT
SPACERS
WASHER
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
SPACER TUBE
LARGE SHIM
SMALL SHIM
LOWER SUPPORT
E

FIGURE 11-87 (SHEET 3 OF 3)

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) If old bond is on spacer, clean with methyl ethyl ketone, Item 233, Appendix D, and wipe dry with clean cloth.

(2) Apply a coat of adhesive, Item 35, Appendix D, on one end of spacer, about as wide as boot collar. Apply a coat of adhesive on inside of boot collar.

(3) Allow adhesive to dry for at least 10 minutes.

(4) Apply a second coat of adhesive to mating surfaces and allow at least 10 minutes for it to dry.

(5) Slide boot on end of spacer and keep lower face of boot and end face of spacer flush. Press collar on boot against spacer all around to be sure of complete contact.

(6) Allow to dry for at least 8 hours.

y. Install spacer tube through opening in airframe.

z. Install replacement lower support, flat side up, against airframe.

NOTE

- When torquing bolt installation, a minimum of one thin washer must be used under the bolthead. If torquing nut, one thin washer must be used under nut.
- A maximum of three washers may be used under the bolthead or nut to make sure of proper bolt length.

aa. Install bolts (head up), using a maximum of three washers in any combination

ab. Install nuts and washer(s). **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** If torquing bolt, **TORQUE BOLT TO 104 - 116 INCH-POUNDS.**

CAUTION

To prevent damage to threads, use a soft-headed mallet to remove tapered pins.

ac. On replacement torque shaft, tap out tapered pins using a soft-headed mallet. Remove lower lever from torque shaft.

NOTE

Mark one tapered pin and its hole to be sure pin is installed in same hole from which it was removed.

ad. Install spacer and boot on torque shaft and slide shaft in upper and lower supports.

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

ae. Install lower lever on torque shaft, line up tapered pin holes and install one tapered pin. Tap pin in to be sure it is fully seated. Do not install nut now.

NOTE

When measuring gap, make sure torque shaft turns freely.

af. On upper deck, pull up on torque shaft and use a feeler gage to measure gap between upper lever and spacer. Record measurement.

ag. Remove tapered pin and remove lower lever from torque shaft. Remove torque shaft from supports.

ah. Unbolt and remove lower support and spacer tube from airframe.

NOTE

- When peeling laminated shims, allow for approximate thickness of adhesive used when installing shims and lower support.
- Use a combination of large and small shims to obtain measured gap.

ai. To shim torque shaft and levers on helicopters prior to Serial No. 83-23842, do this:

(1) **USE NO MORE THAN TWO LARGE SHIMS. TOTAL THICKNESS OF BOTH SHIMS MUST BE 0.100 INCH.**

(2) Peel small laminated shims to obtain measured gap. **MAXIMUM ALLOWABLE THICKNESS OF SHIMS IS 0.162 INCH. SHIMS MUST BE WITHIN 0.032 INCH OF EACH OTHER.**

(3) Apply a light coat of primer, Item 272, Appendix D, on airframe and on both sides of small and large shims. Allow primer to cure at 70° - 80°F (21° - 27°C) for 1 hour.

(4) Apply a light coat of adhesive, Item 31, Appendix D, to airframe and on side of large shim being installed on airframe. Install large shims on airframe.

(5) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes on large shims. Place small shims on large shims.

(6) Clean extra adhesive from holes in shims and airframe.

(7) Allow adhesive, Item 31, Appendix D, to cure at 110° - 130°F (44° - 54°C) for at least 2 hours.

aj. To shim torque shaft and levers on helicopter serial No. 83-23842 and subsequent, do this:

NOTE

If measurement taken in previous step is 0.020 inch or less, shimming is not required.

(1) If measurement taken was 0.021 inch or more add small shims to obtain a maximum gap of 0.020 inch. Total thickness of shims shall be within 0.032 inch of each other.

(2) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes of lower support. Place shims on lower support.

(3) Clean extra adhesive from holes in shims and lower support.

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

(4) Allow adhesive, Item 31, Appendix D, to cure for at least 2 hours at 110° - 130°F (44° - 54°C).

ak. Install spacer tube through opening and lower support, flat side up, against shims and install bolts (head up), washers, and nuts. **TORQUE ALL NUTS TO 95 - 105 INCH-POUNDS.**

al. Install torque shaft, with spacer and boot, in upper and lower support bearings.

NOTE

Record hole and tapered pin positions in shaft and lever before cleaning and priming.

am. Install lower lever on torque shaft and line up tapered pin holes.

an. Wipe holes and surrounding surfaces of all soil using dry machinery towel, Item 227, Appendix D.

ao. Clean holes, shaft, and lever using clean machinery towel, Item 227, Appendix D, wet with trichloroethylene, Item 376, Appendix D. Wipe dry. Do not allow solvent to dry on parts.

ap. Apply two coats of primer, Item 274, Appendix D, to tapered pin holes in shaft and lever using acid brush, Item 88, Appendix D. Allow each coat to dry.

aq. Apply a thin coat (0.002 - 0.003 inch) of sealing compound, Item 312, Appendix D, covering tapered pins. Use acid brush, Item 88, Appendix D.

ar. Install tapered pins wet with sealing compound into proper holes in shaft and lever.

NOTE

Small diameter end of tapered pin shank shall not extend more than 1/16 inch above lever surface. **REPLACE PIN TO OBTAIN CORRECT DIMENSION.**

as. Install washers and nuts ensuring that sealing compound is visible between pin surfaces, washers, and both sides of lever. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

at. Check that torque shaft turns freely in support bearings.

au. Install balance spring in lever. Install pin, washer, and cotter pin, MS24665-170. Adjust balance spring rod to measurement recorded when removed. Tighten jamnuts.

NOTE

If measurement is not known, adjust balance spring (PARA 11-21) after this task is done.

av. Install pitch link between pitch lever and pitch torque shaft lower lever.

aw. Install self-retaining bolt and washers (under head) (PARA 11-1).

ax. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155 (Figure 11-87, Sheet 2, Detail B).

ay. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

az. At torque shaft lever, install long bushing through link and slot in lever and install bolt (1-1/4 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

11-20.2 REPLACE PITCH TORQUE SHAFT AND LEVERS 11-20.2

ba. Install short bushing in slot each side pitch link. Install bolt (1-5/16 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

bb. At pitch lever, install short bushing in slot on each side of pitch link. Install bolt (1-5/16 inch long), washers, and nuts. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153 (Figure 11-87, Sheet 2, Detail B).

bc. Install long bushing in pitch link and slot in pitch lever. Install bolt (1-1/4 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

bd. If removed, connect control rods to pitch lever.

be. Install self-retaining bolt and washers (under head) (PARA 11-1).

bf. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-172.

bg. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bh. On upper deck, connect input control rod between torque shaft lever and pitch/trim assembly lever with adjustable end toward assembly (PARA 11-27).

bi. If necessary, adjust balance spring (PARA 11-21).

bj. Do a rigging check of cyclic flight control system (PARA 11-2).

bk. Check area for cleanness and foreign material.

bl. Install soundproofing in cabin overhead.

bm. Close main rotor pylon sliding cover.

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

REMOVE

NOTE

Torque shaft and levers are a matched set. Parts cannot be replaced separately.

a. Turn off all electrical and hydraulic power.

b. Open main rotor pylon sliding cover.

c. Unbolt control rod from between roll trim actuator and lateral torque shaft lever (PARA 11-27).

d. Unbolt input control rod from roll actuator lever and torque shaft lever (PARA 11-27).

e. Remove soundproofing from cabin overhead, station 247 to 265.

f. If necessary, disconnect control rods from lateral lever (Detail D).

g. Unbolt lateral link from lateral lever and lateral torque shaft lower lever (Detail A).

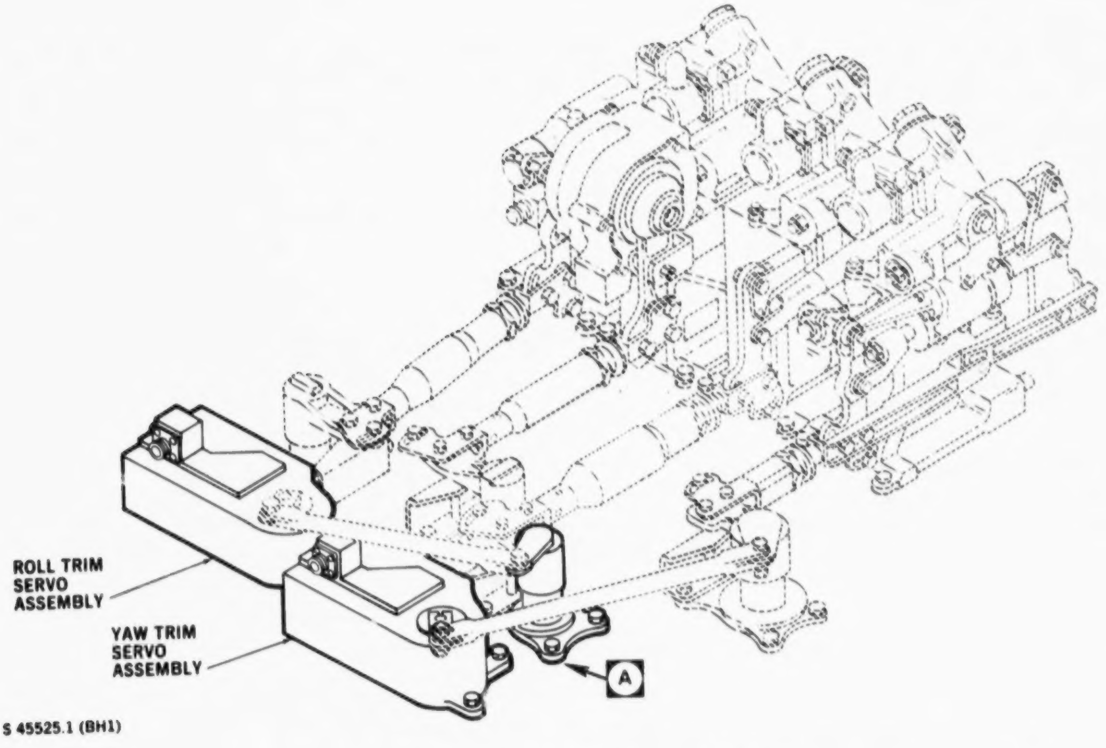


FIGURE 11-88 (SHEET 1 OF 3)

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

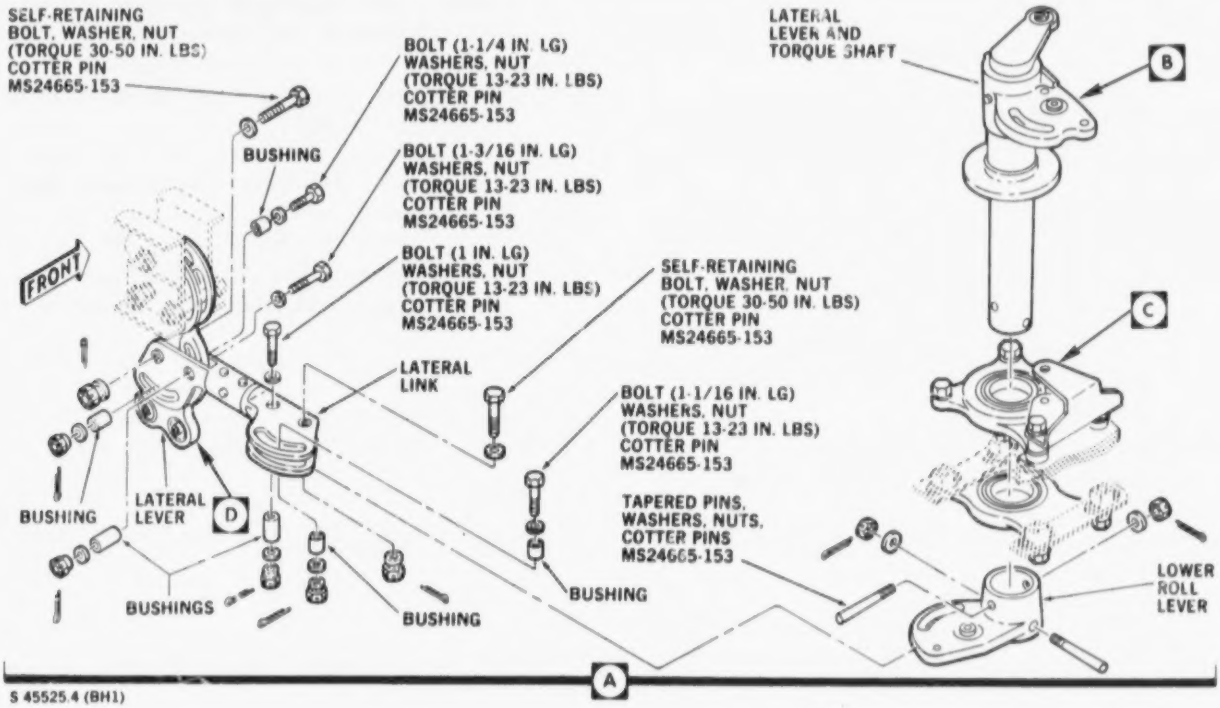

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BOLT (1-1/4 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
BUSHING
BOLT (1-3/16 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
FRONT
BOLT (1 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
LATERAL LINK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BOLT (1-1/16 IN. LG) WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
LATERAL LEVER AND TORQUE SHAFT
B
C
TAPERED PINS, WASHERS, NUTS, COTTER PINS MS24665-153
LOWER ROLL LEVER
BUSHING
LATERAL LEVER
D
BUSHINGS
BUSHING
BUSHING
A
S 45525.4 (BH1)

FIGURE 11-88 (SHEET 2 OF 3)

CAUTION

Use a soft-headed mallet when removing tapered pins so not to damage threads. The tapered pins will be used on assembly unless torque shaft and levers are being replaced.

h. Remove tapered pins and remove lower lever from torque shaft.

i. Remove torque shaft and upper lever from supports. Remove spacer and boot (Detail B).

j. Unbolt lower support, laminated shim, shims, and balance spring bracket from airframe. Remove lower support and spacer tube from airframe. Move bracket and balance spring aside.

k. Remove adhesive from parts as follows:

(1) Remove adhesive from lower support, shims, and airframe using a nonmetallic scraper.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean remaining adhesive from mating surfaces using methyl ethyl ketone, Item 233, Appendix D.

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

l. Unbolt upper support and rigging bracket from airframe. Remove spacers (Detail C).

m. Remove adhesive from upper support, airframe, and washers as follows:

(1) Remove adhesive using a nonmetallic scraper.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean remaining adhesive from mating surfaces with methyl ethyl ketone, Item 233, Appendix D.

INSPECT

n. Inspect tapered pin shank. Tapered surface must be smooth and free of damage, nicks, dents, scratches, or scuff marks. No repair allowed. **REPLACE DAMAGED PIN.**

o. Inspect bearing, MKSP4A-1173 or MKSP4A-400, in lower roll lever using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.0025 INCH.**

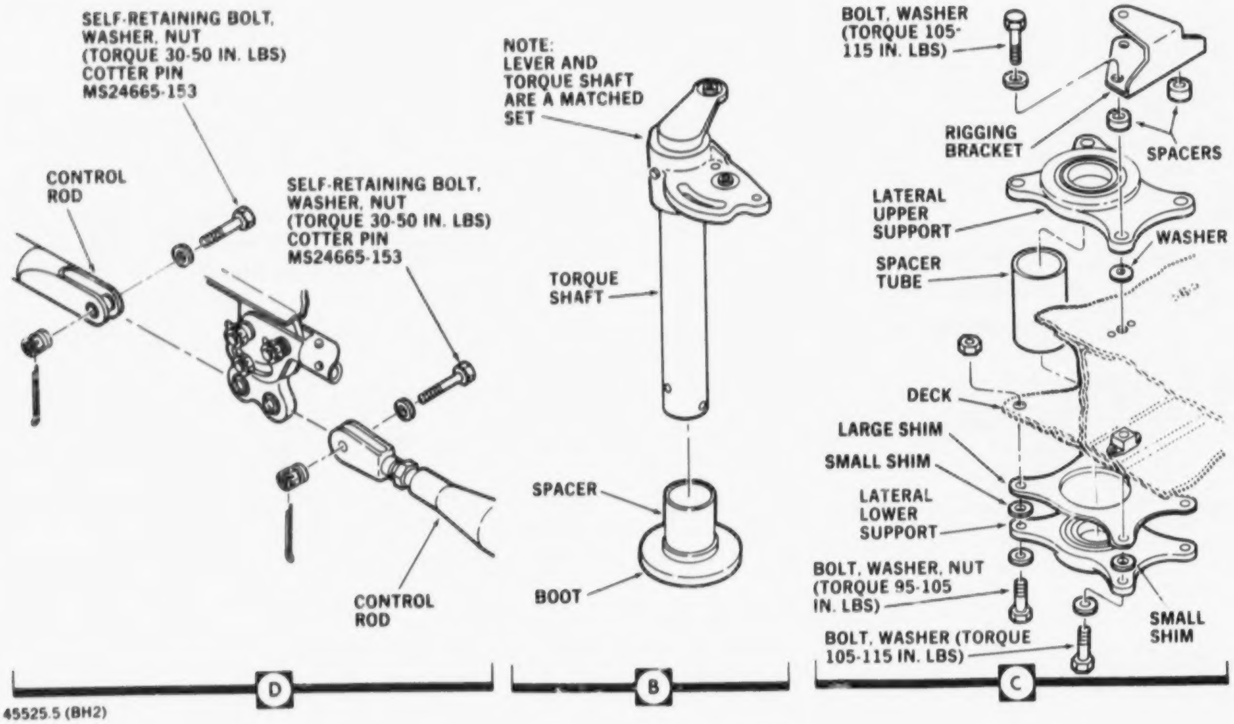

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
D
NOTE: LEVER AND TORQUE SHAFT ARE A MATCHED SET
TORQUE SHAFT
SPACER
BOOT
B
BOLT, WASHER (TORQUE 105-115 IN. LBS)
RIGGING BRACKET
SPACERS
LATERAL UPPER SUPPORT
WASHER
SPACER TUBE
DECK
LARGE SHIM
SMALL SHIM
LATERAL LOWER SUPPORT
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
BOLT, WASHER (TORQUE 105-115 IN. LBS)
SMALL SHIM
C
S 45525.5 (BH2)

FIGURE 11-88 (SHEET 3 OF 3)

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

p. Inspect bearing, MKP21BS-A1173 or MKP21BS-400, in lateral upper or lower support using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

q. Inspect bearing, SA4-14A1-504, in lateral lever and torque shaft using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

r. Turn off all electrical and hydraulic power.

s. Install washers on flat mounting surfaces of upper support as follows:

(1) Apply a coat of sealing compound, Item 312, Appendix D, around mounting holes of upper support. Install washers on support.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean extra sealing compound from holes in washers and support using methyl ethyl ketone, Item 233, Appendix D.

(3) Apply a light coat of sealing compound, Item 312, Appendix D, around holes on airframe and install upper support. Remove extra sealing compound from holes in airframe and support with methyl ethyl ketone, Item 233, Appendix D.

(4) Allow sealing compound to dry for 24 hours or at temperatures of 150° - 180°F (66° - 82°C) for about 2 hours.

t. Install two bolts and washers in left mounting holes of upper support.

u. Place spacers and rigging bracket on right side of upper support. Face rigging hole in bracket toward center of support.

v. Install bolts and washers in rigging bracket and upper support. **TORQUE ALL BOLTS TO 105 - 115 INCH-POUNDS.**

w. Bond replacement boot to spacer as follows:

(1) If old bond is on spacer, clean with methyl ethyl ketone, Item 233, Appendix D, and wipe dry with clean cloth.

(2) Apply a coat of adhesive, Item 35, Appendix D on one end of spacer, about as wide as boot collar. Apply a coat of adhesive on inside of boot collar.

(3) Allow adhesive to dry for at least 10 minutes.

(4) Apply a second coat of adhesive to mating surfaces and allow at least 10 minutes for it to dry.

(5) Slide boot on end of spacer and keep lower face of boot and end face of spacer flush. Press collar on boot against spacer all around to be sure of complete contact.

(6) Allow to dry for at least 8 hours.

x. Install spacer tube through opening in airframe.

y. Install replacement lower support, flat side up, against airframe.

NOTE

- When torquing bolt installation, a minimum of one thin washer must be used under bolthead. If torquing nut, one thin washer must be used under nut.
- A maximum of three washers may be used under the bolthead or nut to make sure of proper bolt length.

z. Install two bolts and washers. **TORQUE BOLTS TO 104 - 116 INCH-POUNDS.**

aa. Install two bolts (head down), using a maximum of three washers in any combination.

ab. Install nuts and washer(s). **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** If torquing bolt, **TORQUE BOLT TO 104 - 116 INCH-POUNDS.**

CAUTION

To prevent damage to threads, use a soft-headed mallet to remove tapered pins.

ac. On replacement torque shaft, tap out tapered pins and remove lower lever from torque shaft.

NOTE

Mark one tapered pin and its hole to be sure pin is installed in same hole from which it was removed.

ad. Install spacer and boot on torque shaft and slide shaft in upper and lower supports.

ae. Install lower lever on torque shaft, line up tapered pin holes, and install one tapered pin. Tap pin in to be sure it is fully seated. Do not install nut now.

NOTE

When measuring gap, make sure torque shaft turns freely.

af. On upper deck, pull up on torque shaft and use a feeler gage to measure gap between upper lever and spacer. Record measurement.

ag. Remove tapered pin and remove lower lever from torque shaft. Remove torque shaft from supports.

ah. Unbolt and remove lower support and spacer tube from airframe.

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

NOTE

- When peeling laminated shims, allow for approximate thickness of adhesive used when installing shims and lower support.
- Use a combination of large and small shims to obtain measured gap.

ai. To shim torque shaft and levers on helicopters prior to serial No. 83-23842, do this:

(1) **USE NO MORE THAN TWO LARGE SHIMS. TOTAL THICKNESS OF BOTH SHIMS MUST BE MAXIMUM 0.100 INCH.**

(2) Peel small laminated shims to obtain measured gap. **MAXIMUM ALLOWABLE THICKNESS OF SHIMS IS 0.162. SHIMS MUST BE WITHIN 0.032 INCH OF EACH OTHER.**

(3) Apply a light coat of primer, Item 272, Appendix D, on airframe and on both sides of small and large shims. Allow primer to cure at 70° - 80°F (21° - 27°C) for 1 hour.

(4) Apply a light coat of adhesive, Item 31, Appendix D, to airframe and on side of large shim being installed on airframe. Install large shims on airframe.

(5) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes on large shims. Place small shims on large shims.

(6) Clean extra adhesive from holes in shims and airframe.

(7) Allow adhesive, Item 31, Appendix D, to cure at 110° - 130°F (44° - 54°C) for at least 2 hours.

aj. To shim torque shaft and levers on helicopter serial Nos 83-23842 and subsequent, do this:

NOTE

If measurement taken in previous steps is 0.020 inch or less, shimming is not required.

(1) If measurement taken was 0.021 inch or more add small shims to obtain a maximum gap of 0.020 inch. Total thickness of shims shall be within 0.032 inch of each other.

(2) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes of lower support. Place shims on lower support.

(3) Clean extra adhesive from holes in shims and lower support.

(4) Allow adhesive, Item 31, Appendix D, to cure for at least 2 hours at 110° - 130°F (44° - 54°C).

ak. Install spacer tube through opening and lower support, flat side up, against shims. Install two bolts (head up), washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** Install two bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

al. Install torque shaft, with spacer and boot, in upper and lower support bearings.

NOTE

Record hole and tapered pin positions in shaft and lever before cleaning and priming.

am. Install lower lever on torque shaft and line up tapered pin holes.

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

an. Wipe holes and surrounding surfaces of all soil using dry machinery towel, Item 227, Appendix D.

ao. Clean holes, shaft, and lever using clean machinery towel, Item 227, Appendix D. Wet with trichloroethylene, Item 376, Appendix D. Wipe dry. Do not allow solvent to dry on parts.

ap. Apply two coats of primer, Item 274, Appendix D, to tapered pin holes in shaft and lever using acid brush, Item 88, Appendix D. Allow each coat to dry.

aq. Apply a thin coat (0.002 - 0.003 inch) of sealing compound, Item 312, Appendix D, covering tapered pins. Use acid brush, Item 88, Appendix D.

ar. Install tapered pins wet with sealing compound into proper holes in shaft and lever.

NOTE

Small diameter end of tapered pin shank shall not extend more than 1/16 inch above lever surface. **REPLACE PIN TO OBTAIN CORRECT DIMENSION.**

as. Install washers and nuts ensuring that sealing compound is visible between pin surfaces, washers, and both sides of lever. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

at. Check that torque shaft turns freely in support bearings.

au. Install lateral link between lateral lever and lateral torque shaft lower lever.

av. Install self-retaining bolt and washers (under head) (PARA 11-1).

aw. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155 (Figure 11-88, Sheet 2, Detail A).

ax. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ay. At torque shaft lever, install long bushing through link and slot in lever and install bolt (1 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

az. Install short bushing in slot on each side of lateral link. Install bolt (1-1/16 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

ba. At lateral lever, install short bushing in slot on each side of lateral link. Install bolt (1-1/4 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

bb. Install long bushing in lateral link and slot in pitch lever. Install bolt (1-3/16 inch long) washers, and nut. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

bc. If removed, connect control rods to lateral lever.

bd. Install self-retaining bolt and washers (under head) (PARA 11-1).

be. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-172 (Figure 11-88, Sheet 3, Detail D).

bf. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-20.3 REPLACE LATERAL TORQUE SHAFT AND LEVERS 11-20.3

bg. Install control rod between roll trim servo and lateral torque shaft lever (PARA 11-27).

bh. Install input control rod between roll servo lever and torque shaft lever (PARA 11-27).

bi. Do a rigging check of cyclic system (PARA 11-2).

bj. Check area for cleanness and foreign material.

bk. Install soundproofing in cabin overhead.

bl. Close main pylon rotor pylon sliding cover.

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

REMOVE

NOTE

Torque shaft and levers are a matched set. Parts cannot be replaced separately.

a. Turn off all electrical and hydraulic power.

b. Open main rotor pylon sliding cover.

c. Unbolt control rod from between yaw trim actuator and yaw torque shaft lever (PARA 11-27).

d. Unbolt input control rod from yaw servo lever and yaw torque shaft lever (PARA 11-27).

e. Remove soundproofing from cabin overhead, station 247 to 265.

f. Disconnect control rods from torque shaft lower lever (PARA 11-27).

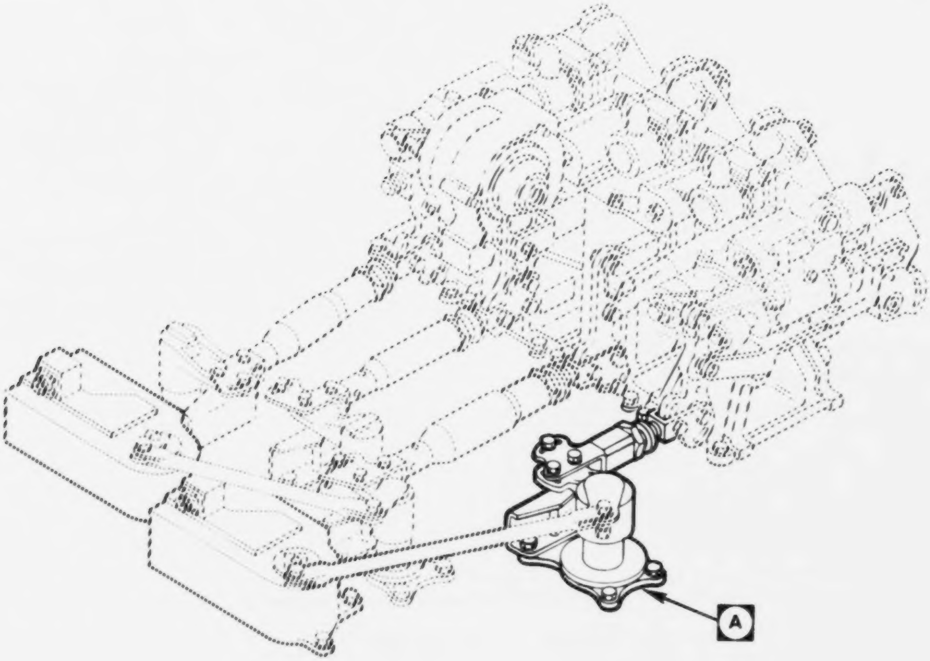
CAUTION

Use a soft-head mallet when removing tapered pins, so not to damage threads. The tapered pins will be used on assembly unless torque shaft and levers are being replaced.

NOTE

Before removing tapered pins, mark one tapered pin and its hole to be sure same pin is installed in same hole it was removed from.

g. Remove tapered pins and lower lever from torque shaft.



S 45526.1 (C9)

FIGURE 11-89 (SHEET 1 OF 3)

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

h. Remove torque shaft and upper lever from supports. Remove spacer and boot (Detail B).

i. Unbolt upper support, rigging bracket, and spacers from airframe.

j. Remove adhesive from upper support, airframe, and washer as follows:

(1) Remove adhesive using a nonmetallic scraper.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean remaining adhesive from mating surfaces with methyl ethyl ketone, Item 233, Appendix D.

k. Unbolt lower support and laminated shims from airframe.

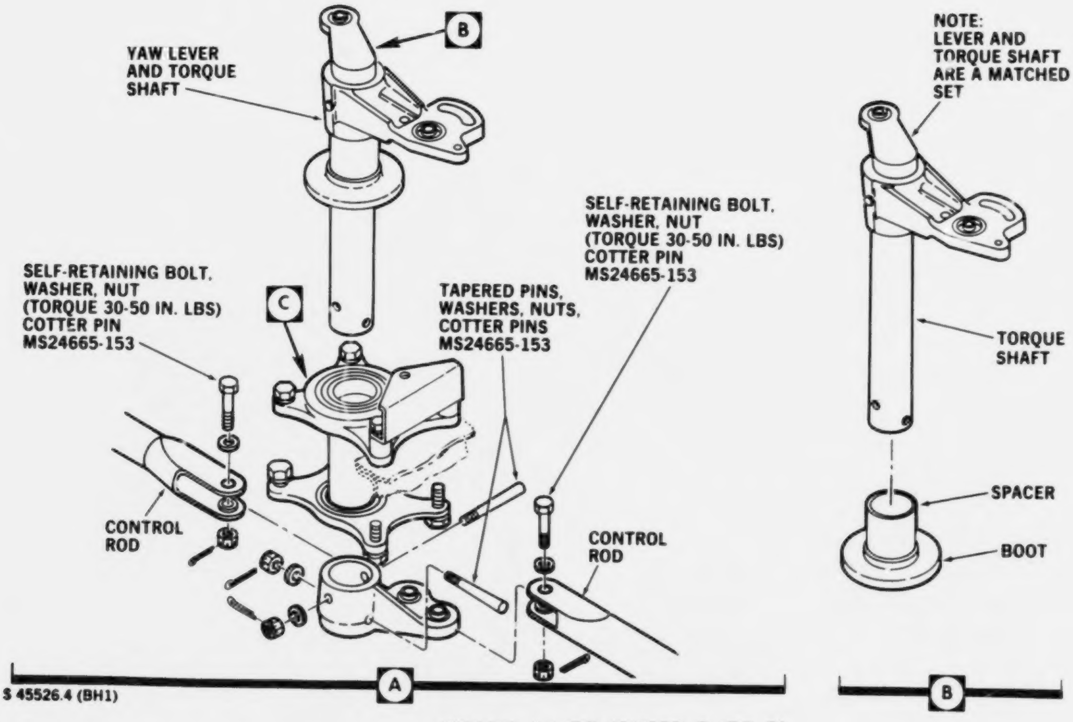

YAW LEVER AND TORQUE SHAFT
B
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
C
TAPERED PINS, WASHERS, NUTS, COTTER PINS MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
CONTROL ROD
A
S 45526.4 (BH1)
NOTE: LEVER AND TORQUE SHAFT ARE A MATCHED SET
TORQUE SHAFT
SPACER
BOOT
B

FIGURE 11-89 (SHEET 2 OF 3)

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

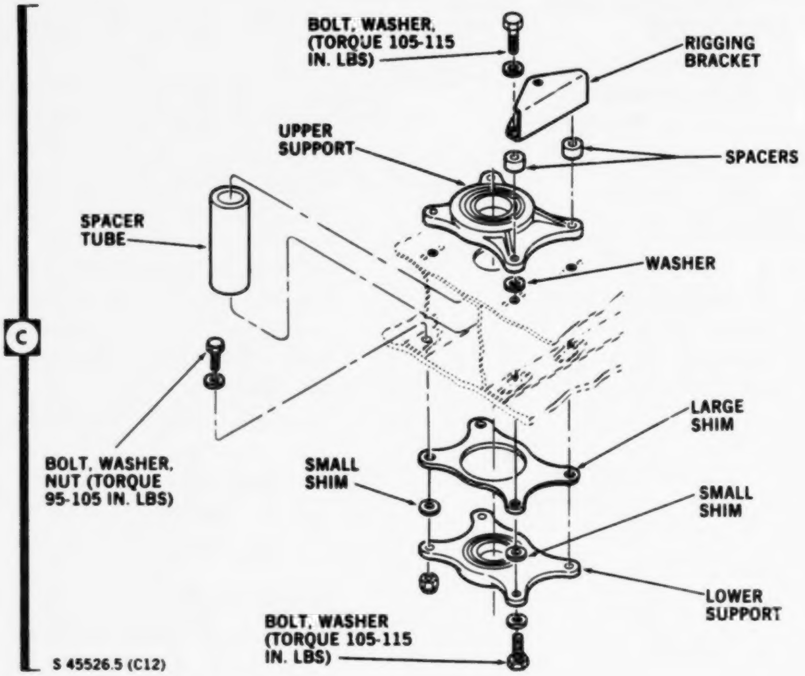

BOLT, WASHER, (TORQUE 105-115 IN. LBS)
RIGGING BRACKET
UPPER SUPPORT
SPACERS
SPACER TUBE
WASHER
C
LARGE SHIM
SMALL SHIM
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
SMALL SHIM
LOWER SUPPORT
BOLT, WASHER (TORQUE 105-115 IN. LBS)
S 45526.5 (C12)

FIGURE 11-89 (SHEET 3 OF 3)

l. Remove adhesive from parts as follows:

  (1) Remove adhesive from lower support, shims, and airframe using a nonmetallic scraper.

  (2) Clean remaining adhesive from mating parts with methyl ethyl ketone, Item 233, Appendix D.

INSPECT

m. Inspect tapered pin shank. Tapered surface must be smooth and free of damage, nicks, dents, scratches, or scuff marks. No repair allowed. **REPLACE DAMAGED PIN.**

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

n. Turn off all electrical and hydraulic power.

o. Install washers on flat mounting surfaces of upper support as follows:

  (1) Apply a coat of sealing compound, Item 312, Appendix D, around mounting holes of upper support. Install washers on sealing compound.

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.

- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(2) Clean extra sealing compound from holes in washers and support using methyl ethyl ketone, Item 233, Appendix D.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.

- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(3) Apply a light coat of sealing compound, Item 312, Appendix D, around holes in airframe and install upper support. Remove extra sealing compound from holes using methyl ethyl ketone, Item 233, Appendix D.

(4) Allow sealing compound to dry for 24 hours or at temperatures of 150° - 180°F (66° - 82°C) for about 2 hours.

p. Install two bolts and washers in left mounting holes of upper support.

q. Place spacers and rigging bracket on right side of upper support. Face rigging hole in bracket toward center of support.

r. Install bolts and washers in rigging bracket and upper support. **TORQUE ALL BOLTS TO 105 - 115 INCH-POUNDS.**

s. Bond replacement boot to spacer as follows:

(1) If old bond is on spacer, clean with methyl ethyl ketone, Item 233, Appendix D, and wipe dry with clean cloth.

(2) Apply a coat of adhesive, Item 35, Appendix D on one end of spacer, about as wide as boot collar. Apply a coat of adhesive on inside of boot collar.

(3) Allow adhesive to dry for at least 10 minutes.

(4) Apply a second coat of adhesive to mating surfaces and allow at least 10 minutes for it to dry.

(5) Slide boot on end of spacer and keep lower face of boot and end face of spacer flush. Press collar on boot against spacer all around to be sure of complete contact.

(6) Allow to dry for at least 8 hours.

t. Install spacer tube through opening in airframe.

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

u. Install replacement lower support, flat side up, against airframe.

NOTE

- When torquing bolt installation, a minimum of one thin washer must be used under the bolthead. If torquing nut one thin washer must be used under nut.

- A maximum of three washers may be used under the bolthead or nut to make sure of proper bolt length.

v. Install two bolts and washers. **TORQUE BOLTS TO 104 - 116 INCH-POUNDS.**

w. Install two bolts (heads up), using a maximum of three washers in any combination.

x. Install nuts and washer(s). **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** If torquing bolt, **TORQUE BOLT TO 104 - 116 INCH-POUNDS.**

CAUTION

To prevent damage to threads, use a soft-headed mallet to remove tapered pins.

y. On replacement torque shaft, tap out tapered pins and remove lower lever from torque shaft.

NOTE

Mark one tapered pin and its hole to be sure pin is installed in same hole from which it was removed.

z. Install spacer and boot on torque shaft and slide shaft in upper and lower supports.

aa. Install lower lever on torque shaft, line up tapered pin holes and install one tapered pin. Tap pin in to be sure it is fully seated. Do not install nut now.

NOTE

When measuring gap, make sure torque shaft turns freely.

ab. On upper deck, pull up on torque shaft and use a feeler gage to measure gap between upper lever and spacer. Record measurement.

ac. Remove tapered pin and remove lower lever from torque shaft. Remove torque shaft from supports.

ad. Unbolt and remove lower support and spacer tube from airframe.

NOTE

- When peeling laminated shims, allow for approximate thickness of adhesive used when installing shims and lower support.

- Use a combination of large and small shims to obtain measured gap.

ae. To shim torque shaft and levers on helicopters prior to serial No. 83-23842, do this:

(1) **USE NO MORE THAN TWO LARGE SHIMS. TOTAL THICKNESS OF BOTH SHIMS MUST BE 0.100 INCH.**

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

(2) Peel small laminated shims to obtain measured gap. **MAXIMUM ALLOWABLE THICKNESS OF SHIMS IS 0.162 INCH. SHIMS MUST BE WITHIN 0.032 INCH OF EACH OTHER.**

(3) Apply a light coat of primer, Item 272, Appendix D, on airframe and on both sides of small and large shims. Allow primer to cure at 70° - 80°F (21 - 27°C) for 1 hour.

(4) Apply a light coat of adhesive, Item 31, Appendix D, to airframe and on side of large shim being installed on airframe. Install large shims on airframe.

(5) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes on large shims. Place small shims on large shims.

(6) Clean extra adhesive from holes in shims and airframe.

(7) Allow adhesive, Item 31, Appendix D, to cure at 110° - 130°F (44° - 54°C) for at least 2 hours.

af. To shim torque shaft and levers on helicopters serial Nos 83-23842 and subsequent, do this:

NOTE

If measurement taken in previous steps is 0.020 inch or less, shimming is not required.

(1) If measurement taken was 0.021 inch or more add small shims to obtain a maximum gap of 0.020 inch. Total thickness of shims shall be within 0.032 inch of each other.

(2) Apply a light coat of adhesive, Item 31, Appendix D, on small shims and around mounting holes of lower support. Place shims on lower support.

(3) Clean extra adhesive from holes in shims and lower support.

(4) Allow adhesive, Item 31, Appendix D, to cure for at least 2 hours at 110° - 130°F (44° - 54°C).

ag. Install spacer tube through opening and lower support, flat side up, against shims. Install two bolts (head up), washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.** Install two bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

ah. Install torque shaft, with spacer and boot, in upper and lower support bearings.

NOTE

Record hole and tapered pin positions in shaft and lever before cleaning and priming.

ai. Install lower lever on torque shaft and line up tapered pin holes.

aj. Wipe holes and surrounding surfaces of all soil using dry machinery towel, Item 227, Appendix D.

ak. Clean holes, shaft, and lever using clean machinery towel, Item 227, Appendix D, wet with trichloroethylene solvent, Item 376, Appendix D. Wipe dry. Do not allow solvent to dry on parts.

al. Apply two coats of epoxy primer, Item 274, Appendix D, to tapered pin holes in shaft and lever using brush, Item 88, Appendix D. Allow each coat to dry.

11-20.4 REPLACE YAW TORQUE SHAFT AND LEVERS 11-20.4

am. Apply a thin coat (0.002 - 0.003 inch) of sealing compound, Item 312, Appendix D, covering tapered pins. Use brush, Item 88, Appendix D.

an. Install tapered pins wet with sealing compound into proper holes in shaft and lever.

NOTE

Small diameter end of tapered pin shank shall not extend more than 1/16 inch above lever surface. **REPLACE PIN TO OBTAIN CORRECT DIMENSION.**

ao. Install washers and nuts ensuring that sealing compound is visible between pin surfaces, washers, and both sides of lever. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

ap. Check that torque shaft turns freely in support bearings.

aq. Connect control rods to lower lever.

ar. Install self-retaining bolt and washers (under head) (PARA 11-1).

as. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153 (Figure 11-89, Sheet 2, Detail A).

at. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

au. On upper deck connect input control rod between torque shaft lever and yaw boost servo lever with adjustable end toward servo (PARA 11-27).

av. Connect control rod between yaw/trim servo and yaw torque shaft assembly (PARA 11-27).

aw. Do a rigging check of yaw flight controls (PARA 11-2).

ax. Check area for cleanness and foreign material.

ay. Install soundproofing in cabin overhead (PARA 2-32).

az. Close main rotor pylon sliding cover.

11-21 BALANCE SPRINGS - REPLACE 11-21

PARAGRAPH BREAKDOWN

11-21.1 REPLACE BALANCE SPRINGS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68G - Aircraft Structural Repairer

MATERIALS/PARTS

- Cotter Pin, MS24665-151
- Cotter Pin, MS24665-153

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Airframe Repairer's Toolkit, SC 5180-99-CL-A02

REFERENCES

- PARA 1-6.2
- PARA 2-32
- PARA 11-2
- PARA 13-1

11-21.1 REPLACE BALANCE SPRINGS 11-21.1

NOTE

Replacing longitudinal (pitch) balance spring and collective balance spring is similar. Collective balance spring should be compressed manually and tied with lockwire before installation.

REMOVE

a. Move yaw pedals to midposition.

b. Turn off all electrical and hydraulic power.

c. Remove ceiling soundproofing panel between stations 247 and 265 (PARA 2-32).

d. Remove heater duct (PARA 13-2).

e. Loosen outer jamnut on adjusting screw until balance spring tension is gone.

f. Remove clevis pin from each end of balance spring and remove spring.

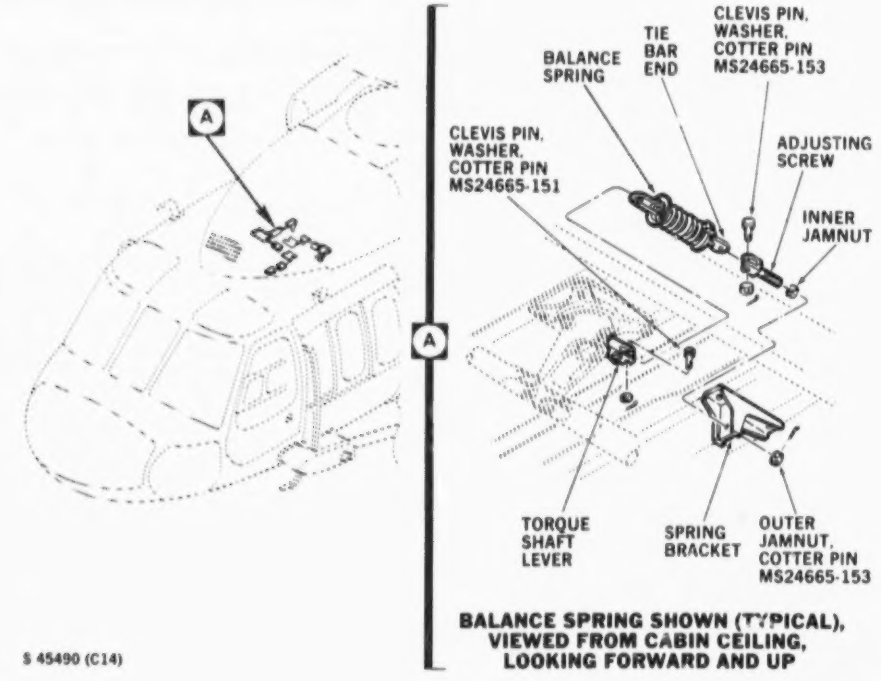
g. If necessary, remove cotter pin, outer jamnut, adjusting screw, and inner jamnut from spring bracket.

INSTALL

h. Turn off all electrical and hydraulic power.

i. If inner jamnut, adjusting screw, and outer jamnut were removed, loosely install on spring bracket. Install outer jamnut just enough to hold adjusting screw in place. Install cotter pin, MS24665-153.

j. Position balance spring on adjusting screw and torque shaft lever, with spring tie bar end towards adjusting screw. Install clevis pin, washer, and cotter pin, MS24665-153.


A
A
BALANCE SPRING
TIE BAR END
CLEVIS PIN, WASHER, COTTER PIN MS24665-153
CLEVIS PIN, WASHER, COTTER PIN MS24665-151
ADJUSTING SCREW
INNER JAMNUT
TORQUE SHAFT LEVER
SPRING BRACKET
OUTER JAMNUT, COTTER PIN MS24665-153
S 45490 (C14)

BALANCE SPRING SHOWN (TYPICAL), VIEWED FROM CABIN CEILING, LOOKING FORWARD AND UP

FIGURE 11-90

11-21.1 REPLACE BALANCE SPRINGS 11-21.1

k. Connect balance spring to torque shaft lever, using pin, washer, and cotter pin, MS24665-151.

l. Adjust balance spring as follows (PARA 11-2):

(1) Adjust inner and outer jamnut until about 5/16 inch of thread is beyond outer nut. This is just a preliminary adjustment.

(2) Connect electrical power or run APU (PARA 1-6.2).

(3) On upper console, place BACKUP HYD PUMP switch ON.

(4) On lower console, push TRIM button off (no light).

(5) Move cyclic stick front and rear. Check force is same in both directions. Stick should not fall forward after it is let go.

(6) Adjust jamnuts as necessary.

(7) Collective stick is balanced the same. If adjusting screw interferes with airframe structure preventing proper adjustment, remove between 0.250 and 0.300 inches from adjusting screw. Clean up threads and provide appropriate chamfer for run-on. If adjusting screw is shortened, drill 0.070-inch-diameter hole 0.110 inch from end of screw for cotter pin.

(8) Adjust jamnuts as necessary.

(9) Install cotter pin, MS24665-153.

NOTE

When moving collective to high position, observe spring expansion and make sure that sliding collar does not come off of inner tube. Also, make sure hooks in spring end remain in slots in tube. If collective stick is hard to lower, do not force, check spring for alignment of hooks.

m. Check area for cleanness and foreign material.

n. Install heating duct (PARA 13-2).

o. Install ceiling soundproofing panel (PARA 2-32).

11-22 MIDSECTION BELLCRANKS AND SHAFT 11-22

PARAGRAPH BREAKDOWN

11-22.1 REPLACE BELLCRANKS AND SHAFT

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Adhesive, Item 31, Appendix D
- Brush Acid, Item 88, Appendix D
- Cotter Pin, MS24665-151
- Cotter Pin, MS24665-153
- Machinery Towel, Item 227, Appendix D
- Masking Tape, Item 228, Appendix D
- Paint
- Paint Remover, Item 255, Appendix D
- Primer, Item 272, Appendix D
- Shim, 70211-02104-138
- Shim, 70211-02104-139
- Tiedown Strap, Item 369, Appendix D
- Wooden Spatula, Item 386, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicator, MIL-I-18422
- Torque Wrench, 30 - 50 in. lbs, GGG-W-00686

REFERENCES

- Appendix H
- PARA 1-6.3
- PARA 2-5
- PARA 11-1
- PARA 11-2
- TM 55-1500-204-25/1

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

NOTE

Removal of left and right bellcranks and shaft is the same.

REMOVE

a. Remove soundproofing between stations 247 and 265.

b. Remove control rod cover going up side of cabin.

c. Turn on electrical power and backup hydraulic system (PARA 1-6.3).

d. Install rig pins in pilot's and copilot's cyclic stick (PARA 11-2).

e. Install rig pins in pilot's and copilot's yaw pedals (PARA 11-2).

f. Install rig pins in collective, pitch, roll, and yaw torque tubes (PARA 11-2).

g. Make sure there is no gap between pilot's collective stick and low stopbolt (PARA 11-2).

NOTE

If pins do not slide in holes, do a main rotor rig check (PARA 11-2).

h. Turn off all electrical and hydraulic power.

i. Unbolt and remove control rods from both ends of bellcranks. Place side control rods to one side. Tie upper control rods up to overhead supports.

j. Unbolt and remove split spacers.

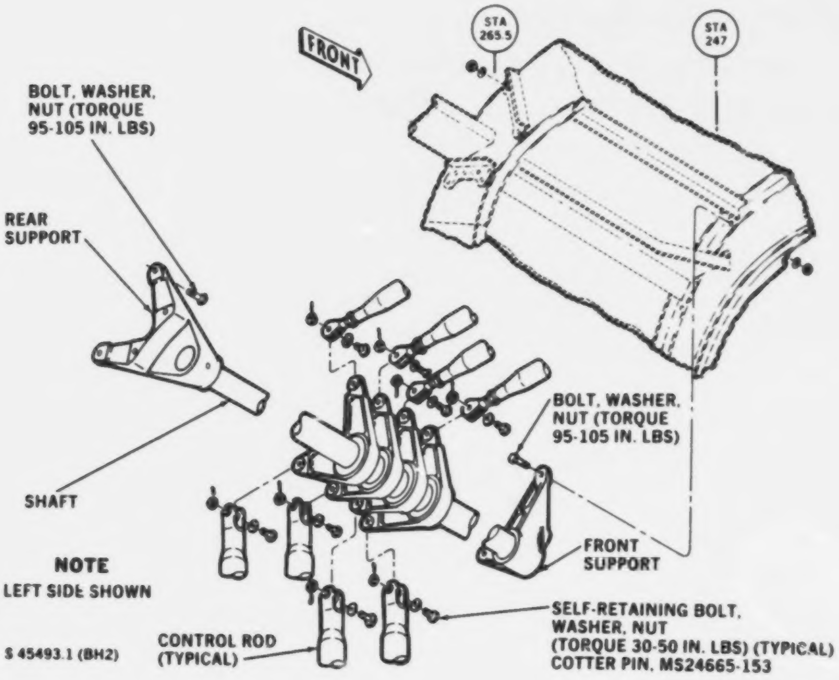

STA 265.5
STA 247
FRONT
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
REAR SUPPORT
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
SHAFT
FRONT SUPPORT
NOTE
LEFT SIDE SHOWN
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) (TYPICAL) COTTER PIN, MS24665-153
S 45493.1 (BH2)
CONTROL ROD (TYPICAL)

FIGURE 11-91 (SHEET 1 OF 7)

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

k. Remove bolt, washer, nut, and radius washer attaching shaft to rear support.

l. Remove bolts holding both front and rear supports to airframe.

m. Slide supports toward center of shaft. Remove shaft, bellcranks, and supports.

DISASSEMBLE BELLCRANKS AND SHAFT

n. Slide shaft supports, spacers, rigging pin adapters as required, and bellcranks from shaft. Tag each piece when removing. This will help proper stackup during installation.

INSPECT

o. Inspect bearing, MKSP4A-A1173 or MKSP4A-400, in directional, roll, pitch, and collective bellcranks using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.0025-INCH.**

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

p. Inspect bearing, SA4-14A1-504, in collective bellcrank using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005-INCH.**

q. Inspect bearings, MKP25B-A1173 or MKP25B-400, in directional, roll, pitch, and collective bellcranks using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005-INCH.**

r. Check shaft for gouges, replace shaft if gouges exceed 0.010 inch.

ASSEMBLE BELLCRANKS AND SHAFT

NOTE

- Some bellcranks will be identified by a painted letter for proper installation. D for directional, R for roll, L for longitudinal, CR for collective right side, CL for collective left side. Others will be identified with a white dot on the upper arm.
- Make sure that long arms with letter, or white dot on pitch, roll, and directional bellcranks point upward, for proper installation.
- Make sure that short arm with letter, or white dot on collective bellcrank points upward for proper installation.
- Helicopters serial Nos 79-23269 through 79-23292 have split spacer, 70400-02177-043, and spacer, 70400-02176-451, installed. Replace these spacers when worn or broken with spacers, 70400-02510-041 and 70400-02176-106.

INSTALL

s. Turn off all electrical and hydraulic power.

s.1. If installing a new rear support bellcrank and no shims are bonded to the frame at station 265.5, do this:

(1) Install rear support on frame at station 265.5 with bolts, washers, and nuts. Make nuts snug against support.

(2) Inspect for gaps between mounting pads of support and airframe.

s.2. If gap is found do this:

(1) Shim using locally made shims 70211-02104-138, and 70211-02104-139 (Appendix H).

(2) Strip paint from front side of frame using paint remover, Item 255, Appendix D and acid brush, Item 88, Appendix D. Wait 15 minutes then wipe dry with machinery towel, Item 227, Appendix D.

(3) Apply primer, Item 272, Appendix D, using acid brush, Item 88, Appendix D. Allow primer to cure at room temperature.

(4) Bond shim to frame with adhesive, Item 31, Appendix D, where bellcrank support mounts to frame. Make sure holes in shim align with holes in frame.

(5) Secure shim in place using masking tape, Item 228, Appendix D.

(6) Allow adhesive, Item 31, Appendix D, to cure at room temperature for 24 hours.

(7) Touch up paint as required (PARA 2-5).

t. Install correct stackup on shaft as tagged (Figure 11-91).

u. Slide supports toward center of shaft. Install assembly on airframe with bolts, washers, and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

v. Install bolt and washer in rear support and shaft. Install radius washer and nut on bolt. **TORQUE NUT TO 50 - 100 INCH-POUNDS.** Install cotter pin MS24665-151.

INSTALL SPLIT SPACERS

w. Push collective and bellcranks toward center of shaft.

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

x. On helicopters prior to serial No. 79-23269, install split spacers on left bellcrank installation by doing this (Figure 11-91, Sheet 2):

(1) If components needed to repair bellcrank installation are not available, bellcrank installation on helicopters serial Nos 79-23269 and subsequent can be used.

(2) Push directional bellcrank to front of helicopter.

(3) Bolt front split spacer on shaft with single bolt inboard. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.**

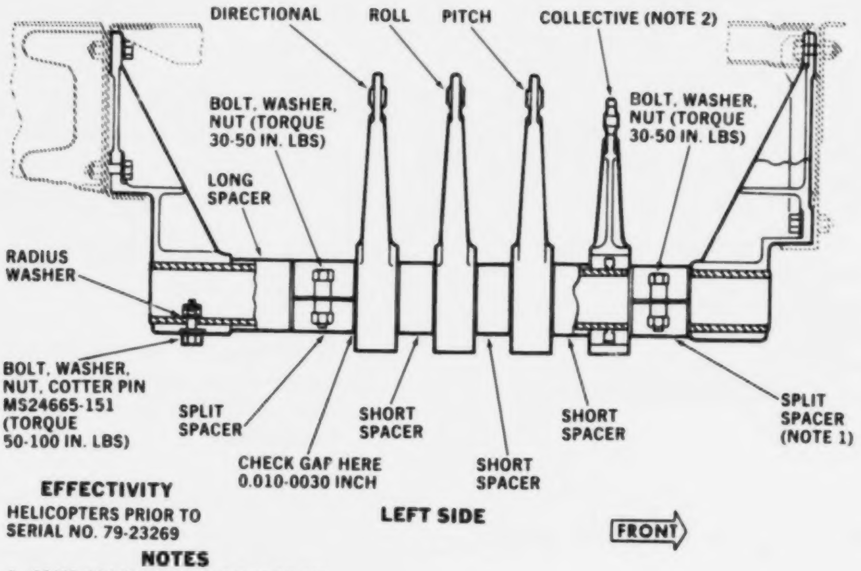
(4) Install rear split spacer on shaft with bolts, washers, nuts, and spacer. **SET 0.010 - 0.030 INCH GAP BETWEEN SPACER AND DIRECTIONAL BELLCRANK WITH FEELER GAGE. TORQUE NUTS TO 30 - 50 INCH-POUNDS.**

y. With bellcranks hanging free, push each bellcrank gently one way or the other. It should return to its first position with no sign of binding.

z. If bellcrank hangs up or has a jerky motion, check gap at split spacer. If gap is correct, replace bellcrank.

aa. On helicopters prior to serial No. 79-23268 install split spacers and rigging pin adapter on right side by doing this (Figure 11-91, Sheet 3):

(1) If components needed to repair bellcrank installation are not available, bellcrank installation on helicopters serial Nos 79-23269 to 85-24438 or serial Nos 85-24438 and subsequent can be used.


DIRECTIONAL
ROLL
PITCH
COLLECTIVE (NOTE 2)
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS)
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS)
LONG SPACER
RADIUS WASHER
BOLT, WASHER, NUT, COTTER PIN MS24665-151 (TORQUE 50-100 IN. LBS)
SPLIT SPACER
SHORT SPACER
SHORT SPACER
SPLIT SPACER (NOTE 1)
CHECK GAP HERE 0.010-0030 INCH
SHORT SPACER
LEFT SIDE
FRONT

EFFECTIVITY

HELICOPTERS PRIOR TO SERIAL NO. 79-23269

NOTES

1. SOLID SPACER MAY BE USED AS AN ALTERNATE FOR SPLIT SPACERS.
2. ENSURE THAT SHORT ARM POINTS UPWARD FOR PROPER INSTALLATION.

S 45493.2 (BH2)

FIGURE 11-91 (SHEET 2 OF 7)

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

(2) **SET 0.010 - 0.060 INCH GAP BETWEEN RIG PIN ADAPTER AND PITCH BELLCRANK.** Rivet rig pin adapter to shaft with arrow facing outboard (TM 55-1500-204-25/1).

(3) If split spacer is installed on front end of shaft do this.

(4) Push bellcranks and spacer against rig pin adapter.

(5) Install front split spacer on shaft with single bolt facing inboard, washers, nuts, and spacer. **SET 0.005 - 0.010 INCH GAP BETWEEN SPACER AND BELLCRANK WITH FEELER GAGE. TORQUE NUTS TO 30 - 50 INCH-POUNDS.**

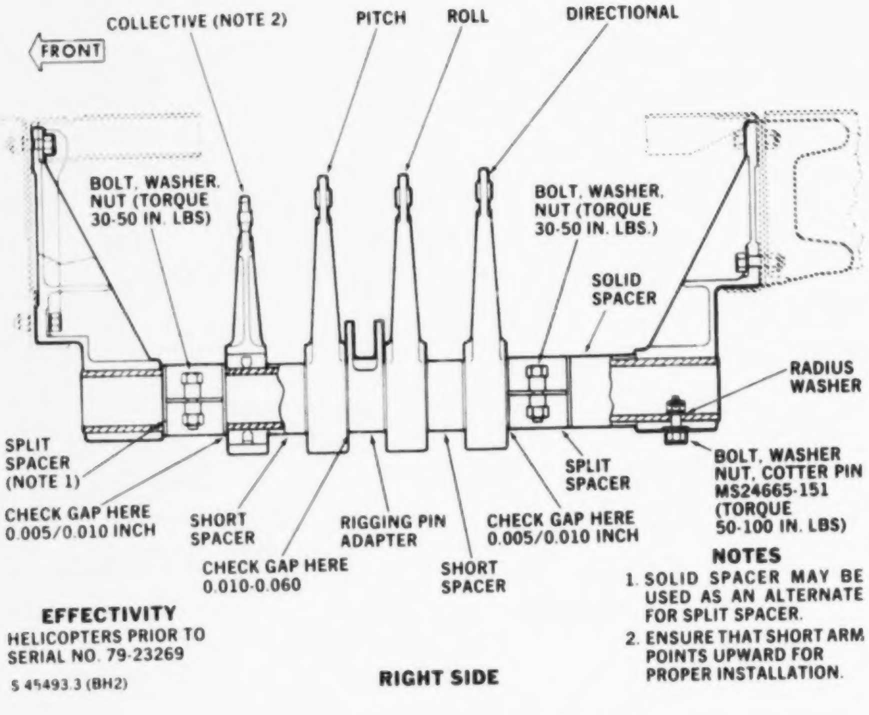
(6) If solid spacer is installed on front end of shaft, **GAP OF UP TO 0.060 INCH ALLOWED.**

(7) Push roll and directional bellcranks and spacer toward rigging pin adapter. Bolt rear split spacer on shaft between directional bellcrank and long spacer.

(8) Using feeler gage, set a 0.005- to 0.010-inch gap between directional bellcrank and end of split spacer.

(9) **TORQUE NUTS TO 30 - 50 INCH-POUNDS.**

(10) With bellcranks hanging free, push each bellcrank gently one way or the other. It should return to its first position with no sign of binding.


COLLECTIVE (NOTE 2)
PITCH
ROLL
DIRECTIONAL
FRONT
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS)
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS.)
SOLID SPACER
RADIUS WASHER
SPLIT SPACER (NOTE 1)
CHECK GAP HERE 0.005/0.010 INCH
SHORT SPACER
RIGGING PIN ADAPTER
CHECK GAP HERE 0.005/0.010 INCH
SPLIT SPACER
BOLT, WASHER NUT, COTTER PIN MS24665-151 (TORQUE 50-100 IN. LBS)
CHECK GAP HERE 0.010-0.060
SHORT SPACER
RIGHT SIDE
S 45493.3 (BH2)

NOTES

1. SOLID SPACER MAY BE USED AS AN ALTERNATE FOR SPLIT SPACER.
2. ENSURE THAT SHORT ARM POINTS UPWARD FOR PROPER INSTALLATION.

EFFECTIVITY
HELICOPTERS PRIOR TO SERIAL NO. 79-23269

FIGURE 11-91 (SHEET 3 OF 7)

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

(11) If bellcrank hangs up or has a jerky motion, check gap at split spacer. If gap is correct, replace bellcrank.

ab. On helicopters serial No. 79-23269 through 85-24438 install split spacers and rigging pin adapter on right side by doing this (Figure 11-91, Sheet 4):

(1) If components needed to repair bellcrank installation are not available, bellcrank installation on helicopters serial Nos 85-24438 and subsequent can be used.

(2) **SET 0.010 - 0.060 INCH GAP BETWEEN RIG PIN ADAPTER AND PITCH BELLCRANK.** Rivet rig pin adapter to shaft with arrow facing outboard (TM 55-1500-204-25/1).

(3) Push directional, roll bellcranks and spacer against rig pin adapter.

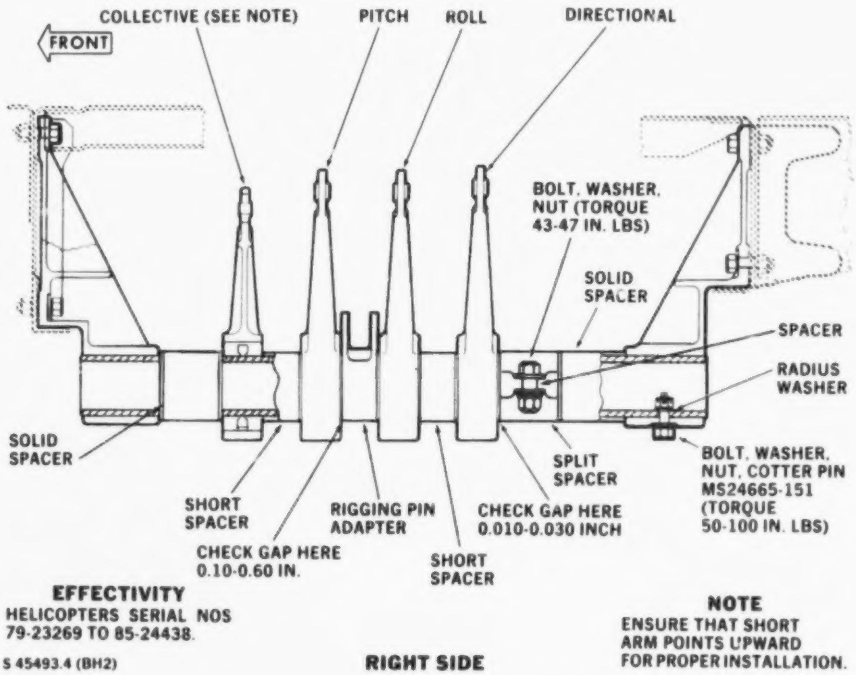
(4) Install rear split spacer on shaft with bolts, washers, nuts, and spacer. **SET 0.010- TO 0.030-INCH GAP BETWEEN SPACER AND DIRECTIONAL BELLCRANK WITH FEELER GAGE. TORQUE NUTS TO 43 - 47 INCH-POUNDS.**

ac. Inspect installed components as follows:

(1) Push pitch bellcrank to front of helicopter. Measure gap between pitch bellcrank and rig pin adapter. **GAP MUST BE LESS THAN 0.060 INCH.**

(2) If gap is greater than 0.060 inch, replace front spacer.

(3) With bellcranks hanging free, push each bellcrank gently one way or the other. It should return to its first position with no sign of binding.


COLLECTIVE (SEE NOTE)
PITCH
ROLL
DIRECTIONAL
FRONT
BOLT, WASHER, NUT (TORQUE 43-47 IN. LBS)
SOLID SPACER
SPACER
RADIUS WASHER
BOLT, WASHER, NUT, COTTER PIN MS24665-151 (TORQUE 50-100 IN. LBS)
SOLID SPACER
SPLIT SPACER
SHORT SPACER
RIGGING PIN ADAPTER
CHECK GAP HERE 0.010-0.030 INCH
CHECK GAP HERE 0.10-0.60 IN.
SHORT SPACER
S 45493.4 (BH2)

EFFECTIVITY
HELICOPTERS SERIAL NOS 79-23269 TO 85-24438.

RIGHT SIDE

NOTE
ENSURE THAT SHORT ARM POINTS UPWARD FOR PROPER INSTALLATION.

FIGURE 11-91 (SHEET 4 OF 7)

(4) If bellcrank hangs up or has a jerky motion, check gap at split spacer. If gap is correct, replace bellcrank.

ad. On helicopters serial Nos 79-23269 and subsequent, install split spacers on left side bellcrank installation by doing this (Figure 11-91, Sheet 5):

(1) Push bellcranks and spacers to front of helicopter.

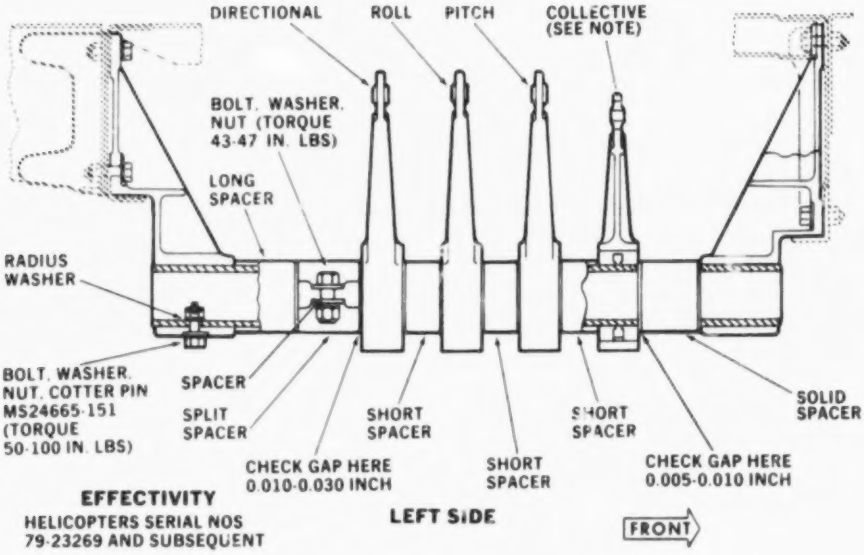
(2) Install rear split spacer on shaft with bolts, washers, nuts, and spacer. **SET 0.010- TO 0.030-INCH GAP BETWEEN SPACER AND DIRECTIONAL BELLCRANK WITH FEELER GAGE. TORQUE NUTS TO 43 - 47 INCH-POUNDS.**

(3) With bellcranks hanging free, push each bellcrank gently one way or the other. It should return to its first position with no sign of binding.

(4) If bellcrank hangs up or has a jerky motion, check gap at split spacer. If gap is correct, replace bellcrank.

ae. On helicopters serial Nos 85-24439 and subsequent, install split spacers on right side bellcrank installation by doing this (Figure 11-91, Sheet 6):

(1) Push bellcranks and spacer to front of helicopter.


DIRECTIONAL
ROLL
PITCH
COLLECTIVE (SEE NOTE)
BOLT, WASHER, NUT (TORQUE 43-47 IN. LBS)
LONG SPACER
RADIUS WASHER
BOLT, WASHER, NUT, COTTER PIN MS24665-151 (TORQUE 50-100 IN. LBS)
SPACER
SPLIT SPACER
SHORT SPACER
SHORT SPACER
SHORT SPACER
SOLID SPACER
CHECK GAP HERE 0.010-0.030 INCH
CHECK GAP HERE 0.005-0.010 INCH
LEFT SIDE
FRONT

EFFECTIVITY

HELICOPTERS SERIAL NOS 79-23269 AND SUBSEQUENT

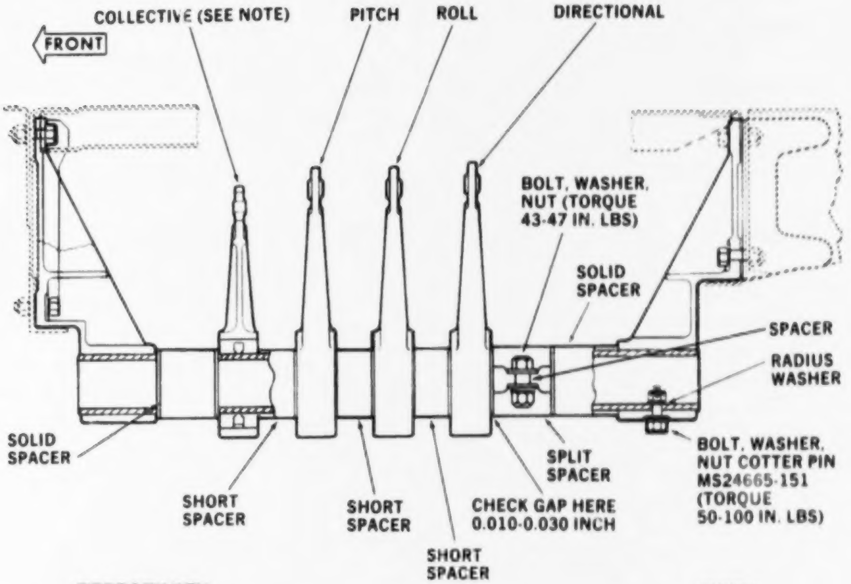
NOTE

ENSURE THAT SHORT ARM POINTS UPWARD FOR PROPER INSTALLATION

S 45493.5 (BH2)

FIGURE 11-91 (SHEET 5 OF 7)

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1


COLLECTIVE (SEE NOTE)
PITCH
ROLL
DIRECTIONAL
FRONT
BOLT, WASHER, NUT (TORQUE 43-47 IN. LBS)
SOLID SPACER
SPACER
RADIUS WASHER
SOLID SPACER
SPLIT SPACER
BOLT, WASHER, NUT COTTER PIN MS24665-151 (TORQUE 50-100 IN. LBS)
SHORT SPACER
SHORT SPACER
CHECK GAP HERE 0.010-0.030 INCH
SHORT SPACER

EFFECTIVITY
HELICOPTERS SERIAL NOS 85-24438 AND SUBSEQUENT.

S 45493.6 (BH2)

RIGHT SIDE

NOTE
ENSURE THAT SHORT ARM POINTS UPWARD FOR PROPER INSTALLATION.

FIGURE 11-91 (SHEET 6 OF 7)

(2) Install rear split spacer on shaft with bolts, washers, nuts, and spacer. **SET 0.010 - 0.030 INCH GAP BETWEEN SPACER AND DIRECTIONAL BELLCRANK WITH FEELER GAGE. TORQUE NUTS TO 43 - 47 INCH-POUNDS.**

(3) With bellcranks hanging free, push each bellcrank gently one way or the other. It should return to its first position with no sign of binding.

(4) If bellcrank hangs up or has a jerky motion, check gap at split spacer. If gap is correct, replace bellcrank.

INSTALL CONTROL RODS ON BELLCRANKS

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

af. Turn on electrical power and back up hydraulic system (PARA 1-6.3).

11-22.1 REPLACE BELLCRANKS AND SHAFT 11-22.1

ag. Connect control rods to bellcranks.

ah. Install self-retaining bolt and washers (under head) (PARA 11-1).

ai. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

aj. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

NOTE

Control rods should bolt to bellcranks without adjustment. If control rods do not line up with bellcranks, check bellcranks for proper installation.

ak. Check pilot's collective stick for no gap between stick and low stopbolt. If there is a gap, recheck collective bellcrank installation.

al. Remove rig pins from collective, pitch, roll, and yaw torque tubes.

am. Remove rig pins from pilot's and copilot's yaw pedals.

an. Remove rig pins from pilot's and copilot's cyclic sticks.

ao. Cycle flight controls, to be sure they are free for full range of travel.

ap. Turn off all electrical and hydraulic power.

aq. Check area for cleanness and foreign material.

ar. Install control rod cover.

as. Install soundproofing.

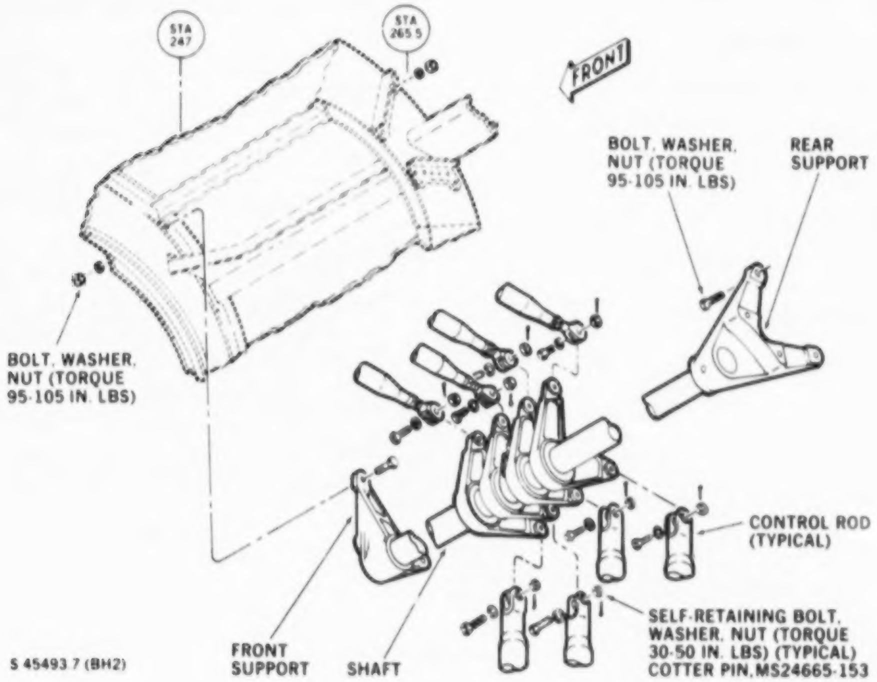

STA 247
STA 265.5
FRONT
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
REAR SUPPORT
BOLT, WASHER, NUT (TORQUE 95-105 IN. LBS)
CONTROL ROD (TYPICAL)
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) (TYPICAL) COTTER PIN, MS24665-153
S 45493 7 (BH2)
FRONT SUPPORT
SHAFT

FIGURE 11-91 (SHEET 7 OF 7)

11-23 CONTROL RODS - REPAIR (AVIM) 11-23

PARAGRAPH BREAKDOWN

11-23.1 REPAIR CONTROL RODS (AVIM)
11-23.2 REPAIR TORQUE SHAFT TO BOOST SERVO CONTROL RODS (AVIM)
11-23.3 REPAIR BOOST SERVO TO MIXER CONTROL RODS (AVIM)
11-23.4 REPAIR PRIMARY SERVO CONTROL RODS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 7, Appendix D
- Acetone, Item 20, Appendix D
- Cheesecloth, Item 98, Appendix D
- Corrosion Preventive Compound, Item 120, Appendix D
- Corrosion Remover, Item 119, Appendix D
- Degreasing Solvent, Item 131, Appendix D
- Epoxy Primer, Item 150, Appendix D
- Solid Film Lubricant, Item 217, Appendix D
- Masking Tape, Item 228, Appendix D
- Retaining Compound, Item 283, Appendix D
- Surface Primer, Grade T, Item 333, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Arbor Press, OO-P-636
- Bushing Installation Kit, 87065
- Cotton-Tipped Applicator, Item 84, Appendix D
- Dial Indicator, MIL-I-18422
- Engine Borescope Kit, 6650-T700-003
- Fluorescent Penetrant Inspection Kit, XMA101
- Small Arms Cleaning Kit, 1005-00-556-4102

REFERENCES

- PARA 11-27
- TM 43-0105
- TM 55-1500-204-25/1
- TM 55-1500-335-23
- TM 55-1500-322-24

11-23.1 REPAIR CONTROL RODS (AVIM) 11-23.1

DISASSEMBLE

a. Disassemble control rods (PARAS 11-23.2, 11-23.3, and 11-23.4).

INSPECT

b. Visually inspect control rods using procedures in TM 55-1500-335-23. Inspect interior areas of adjustable control rods by removing adjustable ends and using an engine borescope.

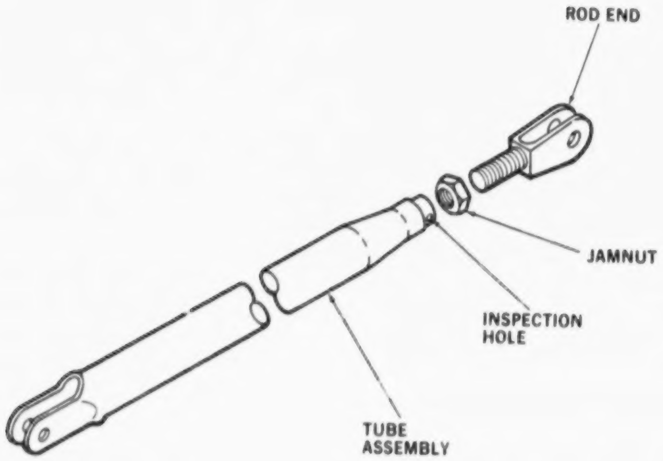
c. Clean parts, except bearings with degreasing solvent, Item 131, Appendix D. Blow dry with dry compressed air.

d. Check for suspected cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

e. Inspect for loose bushings, and rivets, damage to threads, worn or rounded wrench flats, corrosion, and damage to tube.

f. Replace aluminum control rods if internal corrosion cannot be cleaned with small arms cleaning equipment, or if it extends in a band more than 30% around ID, or if there are external pits greater than 0.010 inch deep.

g. Replace steel control rods if there are corrosion pits greater than can be readily blended out with emery cloth. Replace steel control rods if there is any evidence of looseness between either insert and tube, or if there is any evidence of rust bleeding out from between insert(s) and tube. Replace rod ends if corrosion pits are greater than 0.010 inch deep.



S 53766 (C4)

FIGURE 11-92

11-23.1 REPAIR CONTROL RODS (AVIM) 11-23.1

h. Replace control rods and fittings which have SS4045 and/or 70400-08107-110 bushings installed in ends if pits on bushings are deeper than 0.030 inch, or if pitting is greater than 50% of the reamed bore area.

i. Inspect for scratches, nicks, dents no deeper than 0.020 inch except on tube. Allow 0.010 inch on tube.

j. Check control rods 70400-02264-056 and -064 (roll boost servo to mixer) 70400-02264-057 and -063 (collective boost servo to mixer) and 70400-02258-047 and -048 (mixer to forward primary servo) for condition of dry film lubricant coating on fixed end OD (Figure 11-94, Detail B). Repair or replace coatings which are flaked or scratched through to base metal.

NOTE

Gouged or badly worn dry film lubricant coatings may be caused by too much pivot bearing wear. Check bearings as necessary.

k. Check control rod pivot bearing for seal damage, lubricant loss and roughness (TM 55-1500-322-24). Check bearing wear at inner race with a dial indicator. **REPLACE BEARINGS WORN OR DAMAGED BEYOND LIMITS (Table 11-6).**

TABLE 11-6

BEARING WEAR LIMITS

Bearing Part No.	Radial Wear Max Inches
SA 4-14A1-504	0.0050
MKSPA-400	0.0025
MKSP4-A1[illegible]73	0.0025

NOTE

Repair to control rods is limited, except as noted, to replacing parts as necessary after inspection.

REPAIR

l. Blend out any scratch, nick, or dent within damage limits.

m. Remove loose corrosion from exterior surfaces of flight control components using procedures in TM 43-0105. Remove corrosion from internal bores of flight control rods, using small arms cleaning equipment. Wipe area with cloth dampened with corrosion remover, Item 119, Appendix D.

DRY FILM LUBRICANT REPAIR

n. Recondition dry film lubricant coated surfaces on control rods 70400-02264-056, -064, -057, -063 and 70400-02258-047 and -048 as follows:

CAUTION

Ball and roller bearings will be damaged by degreasing solvent and/or abrasive dust. Keep solvent or sanding dust from getting in bearings.

(1) Lightly roughen remaining film coating and/or bare metal with 320-grit abrasive cloth, Item 7, Appendix D.

(2) Remove sanding dust and grime with clean cheesecloth, Item 98, Appendix D, moistened with acetone, Item 20, Appendix D. Turn cloth to a clean patch after each wipe until cloth remains clean after wiping part. Do not touch treated surfaces. Change cloth as often as needed until you get a clean wipe.

11-23.1 REPAIR CONTROL RODS (AVIM) 11-23.1

(3) Thoroughly mix solid film lubricant, Item 217, Appendix D, per manufacturer's instructions. Apply a thin even coat to rod end. Allow part to cure undisturbed for at least 12 hours, at room temperature.

o. Test solid film lubricant bond with base metal by sticking a length of masking tape, Item 228, Appendix D, to cured film. Pull up tape. Coating shall not separate from base metal. A light powdery dust lifted by tape is permitted.

p. A serviceable solid film lubricant application will have a smooth flat black appearance. A high gloss is caused by not enough mixing before application. A dry, easily flaked condition is caused by a poor bond. Strip off unsatisfactory coatings and rework part as required.

PIVOT BEARING REPLACEMENT

q. Replace bearings on control rods 70400-02264-056, -064, -057, -063 and 70400-02258-047 and -048 as follows:

(1) Support rod end fitting. Press out old bearing with an arbor press and a suitable mandrel (TM 55-1500-204-25/1).

(2) Remove all old retaining compound from rod end bore with 320-grit abrasive cloth, Item 7, Appendix D.

(3) Remove all sanding dust and oil from replacement bearing OD and rod end with cheesecloth, Item 98, Appendix D, moistened with degreasing solvent, Item 131, Appendix D. Turn or replace cloth after each wipe. Do not touch treated surface. Turn or replace cloth as needed until cloth remains clean after last wipe.

NOTE

Dipping a brush, swab or other tool into primer or retaining compound containers will contaminate all of the material in the container. To avoid contamination, pour material onto brush or swab as needed.

(4) Apply a thin coat of surface primer, Grade T, Item 333, Appendix D to rod end bore only with a clean cotton-tipped swab. A break, or birds-eye in wet primer indicates a contaminated base surface. Reclean and reprime contaminated work.

(5) Allow primer coat to dry undisturbed for 15 -30 minutes. Do not touch primed surface.

(6) Use a clean cotton tipped swab to cover bearing OD and rod end bonding surfaces with retaining compound, Item 283, Appendix D. Assemble bearing into rod end within 4 minutes of retaining compound application. **IF BEARING IS NOT INSTALLED WITHIN 4 MINUTES, DO ENTIRE CLEANING, PRIMING AND RETAINING COMPOUND APPLICATION AGAIN.**

(7) Dry bearing installation a minimum of 24 hours at room temperature. Retaining compound squeeze out will not dry. Wipe away compound squeeze out with a clean cloth dampened with degreasing solvent, Item 131, Appendix D.

r. Do a bearing rotational drag check as follows:

(1) Install a suitable bolt, washers, and nut through rod end bearing.

(2) Turn bearing inner race with a torque wrench and socket. Measure torque needed to get inner race to turn. If drag is greater than allowed by Table 11-7, replace bearing.

11-23.1 REPAIR CONTROL RODS (AVIM) 11-23.1

ASSEMBLE

s. Assemble control rod (PARAS 11-23.2, 11-23.3, and 11-23.4).

TABLE 11-7

Control Rod Assy, Part No.	Bearing Part No. (Type)	Bearing-Rod End Location	Max. Rotational Drag Inch-Ounces
70400-02264-056	SA4-14A1-504 (ROLLER)	ADJUSTABLE	8
70400-02264-057		FIXED	
70400-02264-064		ADJUSTABLE	
70400-02258-047	MKSP4-A1173 ALTERNATE MKSP4-400 (BALL)	FIXED	2
70400-02258-048			
70400-02264-056			
70400-02264-063			
70400-02264-064			

11-23.2 REPAIR TORQUE SHAFT TO SERVO CONTROL RODS (AVIM) 11-23.2

DISASSEMBLE

a. Loosen rod end jamnut on adjustable rod end and back it away so locking device (-2) can be slid away from locking device (-1).

b. Unscrew rod end from sleeve. Remove locking devices, and jamnut from adjustable rod end.

c. Loosen sleeve jamnut. Remove sleeve from tube assembly. Remove jamnut from sleeve.

d. On servo-to-mixer collective control rod, loosen jamnuts on adjustor.

e. Unscrew rod end from adjustor. Remove locking devices and jamnut from adjustor.

f. Unscrew adjustor from tube assembly. Remove jamnut from adjustor.

INSPECT/REPAIR

g. Inspect and repair control rods (PARA 11-23.1).

ASSEMBLE

h. Install sleeve jamnut on sleeve and thread sleeve into tube assembly.

i. Set 0.50- to 0.45-inch dimension from face of sleeve jamnut to face of sleeve (Detail A).

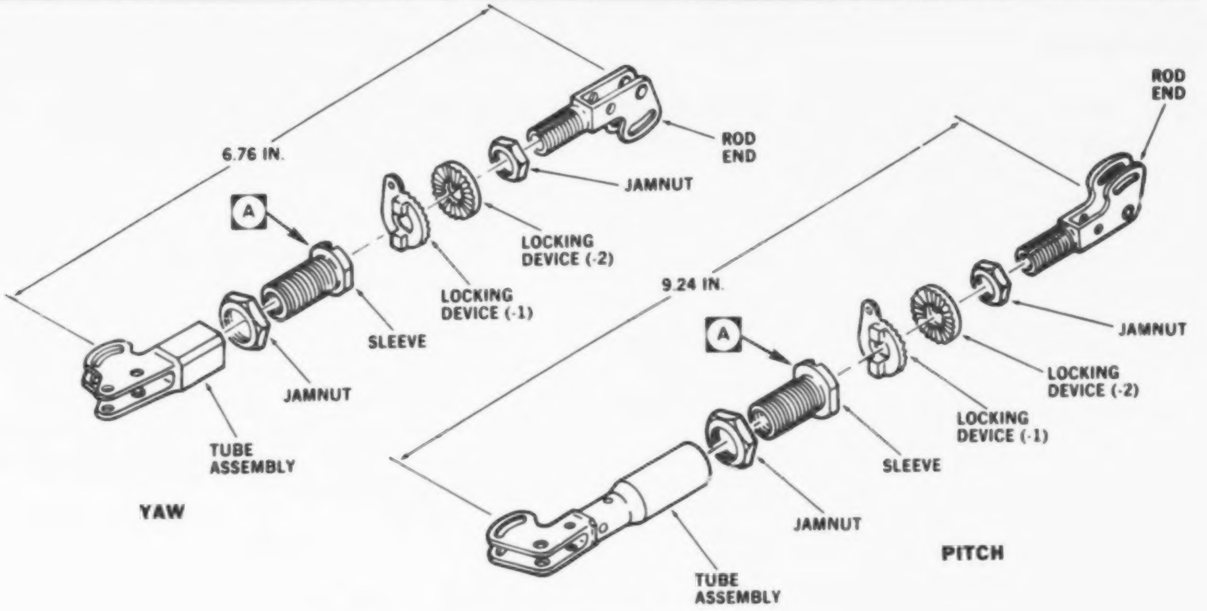
j. Install jamnut, locking device (-2) and locking device (-1) on adjustable rod end. Thread rod end into sleeve.

NOTE

Locking devices' serrated sides face each other.

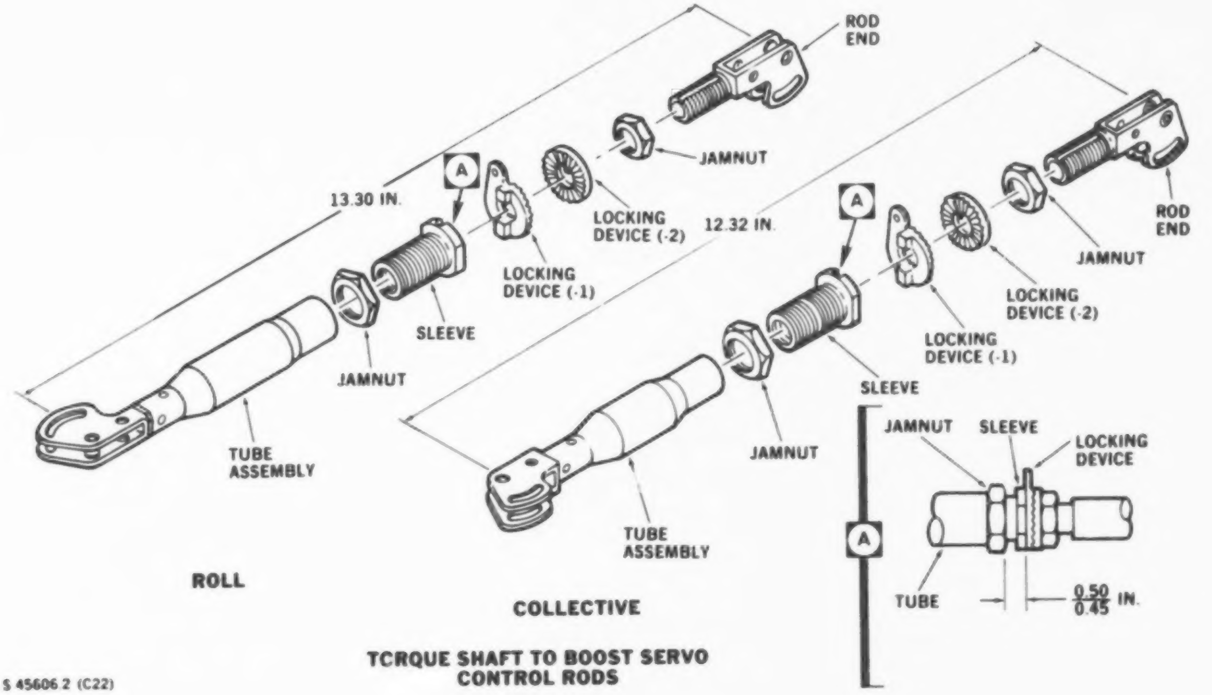
k. Set control rod length (Figure 11-93).

11-23.2 REPAIR TORQUE SHAFT TO SERVO CONTROL RODS (AVIM) 11-23.2


6.76 IN.
A
ROD END
JAMNUT
LOCKING DEVICE (-2)
LOCKING DEVICE (-1)
SLEEVE
JAMNUT
TUBE ASSEMBLY
YAW
ROD END
9.24 IN.
A
JAMNUT
LOCKING DEVICE (-2)
LOCKING DEVICE (-1)
SLEEVE
JAMNUT
TUBE ASSEMBLY
PITCH

TORQUE SHAFT TO BOOST SERVO CONTROL RODS

S 45606.1 (C22)


ROD END
JAMNUT
13.30 IN.
A
LOCKING DEVICE (-2)
LOCKING DEVICE (-1)
SLEEVE
JAMNUT
TUBE ASSEMBLY
ROLL
12.32 IN.
A
ROD END
JAMNUT
LOCKING DEVICE (-2)
LOCKING DEVICE (-1)
SLEEVE
JAMNUT
TUBE ASSEMBLY
COLLECTIVE
A
JAMNUT
SLEEVE
LOCKING DEVICE
TUBE
0.50
0.45 IN.

TCRQUE SHAFT TO BOOST SERVO CONTROL RODS

S 45606.2 (C22)

FIGURE 11-93

11-23.3 REPAIR BOOST SERVO TO MIXER CONTROL RODS (AVIM) 11-23.3

DISASSEMBLE

a. Disassemble control rod (PARA 11-23.2).

INSPECT/REPAIR

b. Inspect control rod (PARA 11-23.1).

NOTE

Adjustor has 5/8 - 11 thread on one end and 5/8 - 18 thread on the other end.

c. On boost servo-to-mixer collective control rod, install jamnuts on adjustor.

ASSEMBLE

NOTE

Handtighten jamnuts. Control rod length will be adjusted when installed in helicopter.

d. Install 18-thread end of adjustor in tube assembly.

e. Install locking devices (-2) and (-1) on adjustor in that order with serrations facing each other.

f. Thread rod end on adjustor and set length of control rod.

g. Keep adjustor threaded about same distance into tube assembly and rod end.

h. Keep rod ends parallel with each other.

i. Set locking device (-1) key in rod end key slot.

j. Handtighten jamnuts.

k. Touch up paint with epoxy primer, Item 150, Appendix D.

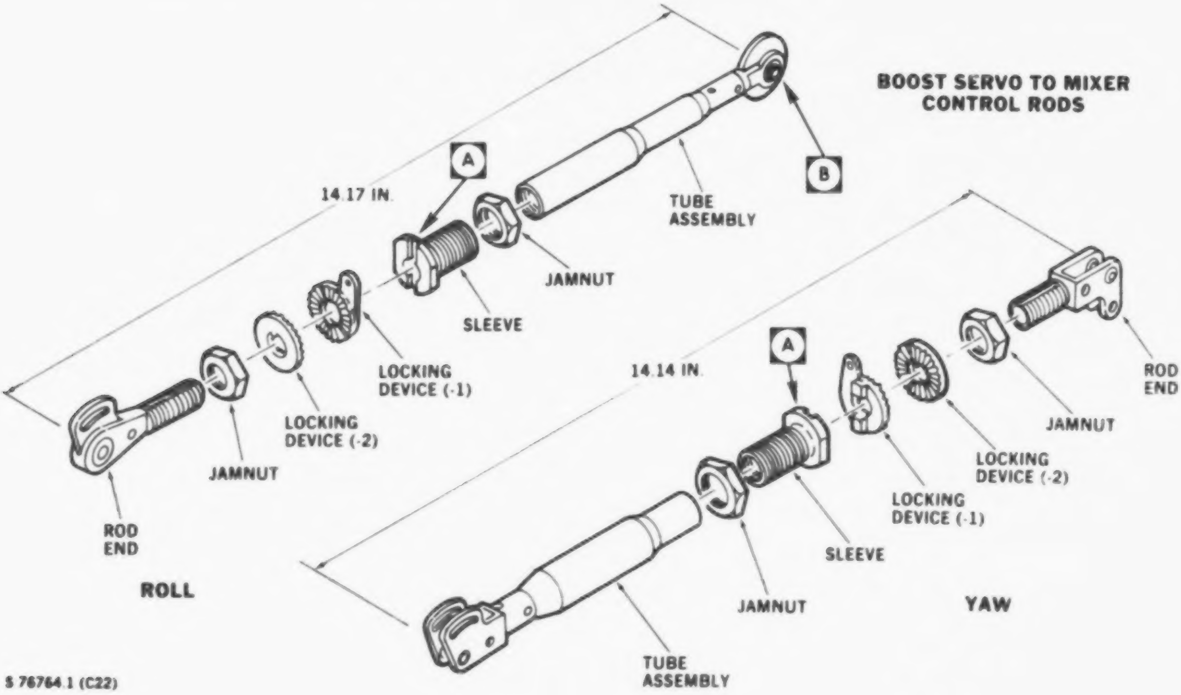

BOOST SERVO TO MIXER CONTROL RODS
A
B
14.17 IN.
TUBE ASSEMBLY
JAMNUT
SLEEVE
LOCKING DEVICE (-1)
LOCKING DEVICE (-2)
JAMNUT
ROD END
ROLL
A
14.14 IN.
ROD END
JAMNUT
LOCKING DEVICE (-2)
LOCKING DEVICE (-1)
SLEEVE
JAMNUT
YAW
TUBE ASSEMBLY
S 76764.1 (C22)

FIGURE 11-94 (SHEET 1 OF 2)

11-23.3 REPAIR BOOST SERVO TO MIXER CONTROL RODS (AVIM) 11-23.3

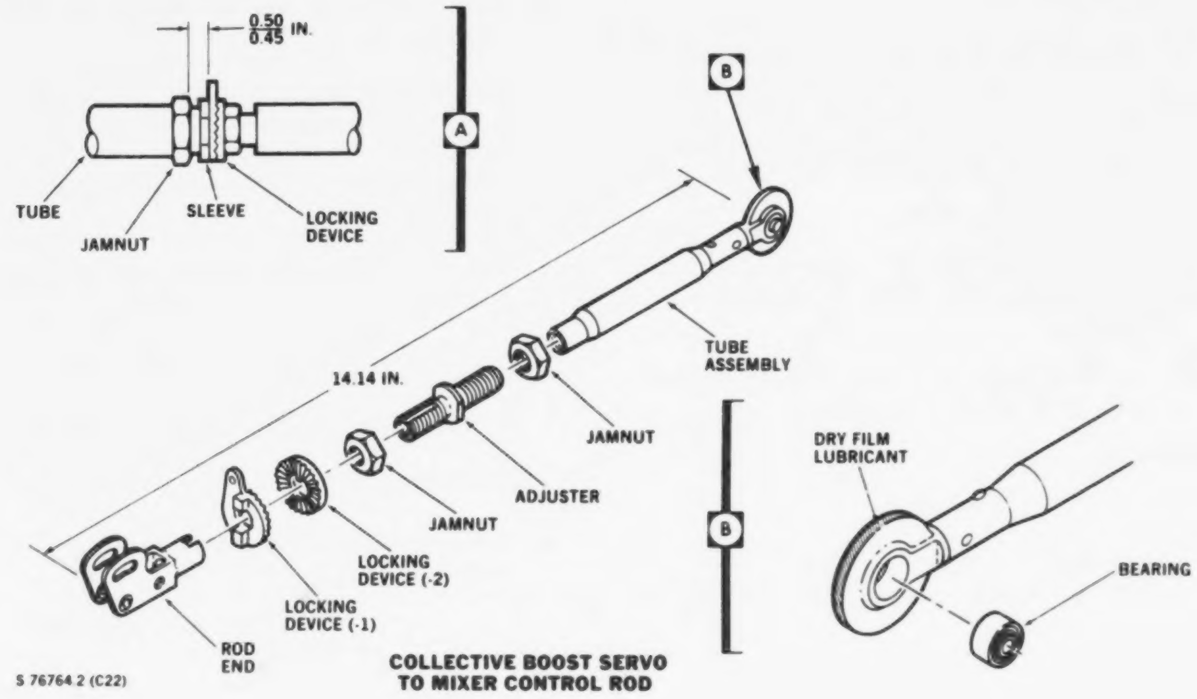

0.50
0.45 IN.
TUBE
JAMNUT
SLEEVE
LOCKING DEVICE
A
B
TUBE ASSEMBLY
14.14 IN.
JAMNUT
ADJUSTER
JAMNUT
LOCKING DEVICE (-2)
LOCKING DEVICE (-1)
ROD END
B
DRY FILM LUBRICANT
BEARING
COLLECTIVE BOOST SERVO TO MIXER CONTROL ROD
S 76764.2 (C22)

FIGURE 11-94 (SHEET 2 OF 2)

11-23.4 REPAIR PRIMARY SERVO CONTROL RODS (AVIM) 11-23.4

DISASSEMBLE

NOTE

Repair to primary servo control rod is limited to replacing parts. No repairs will be made to parts, except for blending out of minor scratches, nicks, or dents within limits (PARA 11-23.1).

a. Loosen two jamnuts (large one has left-hand thread).

b. Unscrew rod end clevis from barrel. Remove locking devices and jamnut from rod end clevis.

c. Unscrew barrel from tube assembly (left-hand thread). Remove jamnut from tube assembly.

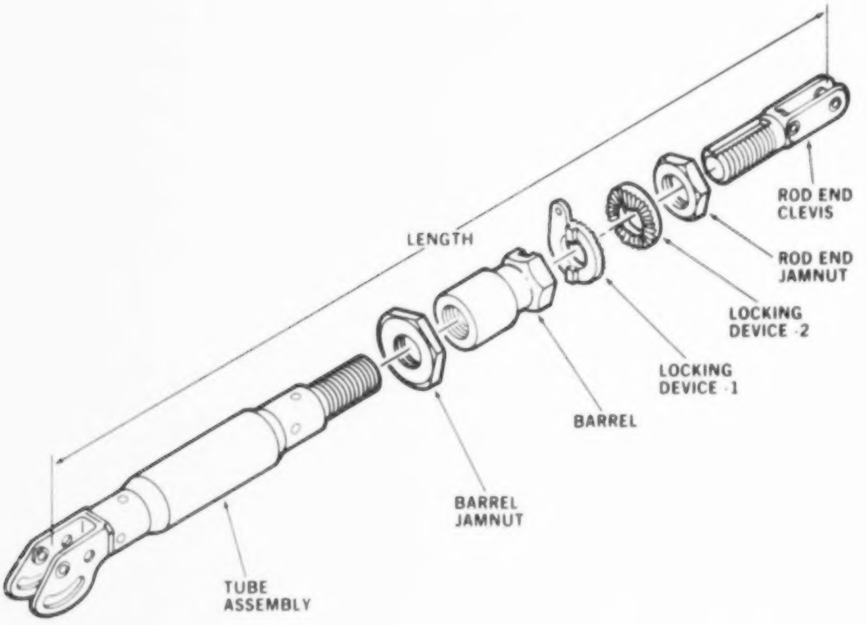
INSPECT/REPAIR

d. Inspect and repair control rods (PARA 11-23.1).

ASSEMBLE

e. Install large jamnut on tube assembly (left-hand thread). Thread barrel on tube assembly until tube assembly touches shoulder inside barrel. Back off about 1/4 turn. Handtighten jamnut.

f. Install jamnut and locking devices on rod end clevis. Install rod end clevis into barrel as far as possible.


LENGTH
ROD END CLEVIS
ROD END JAMNUT
LOCKING DEVICE -2
LOCKING DEVICE -1
BARREL
BARREL JAMNUT
TUBE ASSEMBLY

S 45607 (C4)

FIGURE 11-95

11-23.4 REPAIR PRIMARY SERVO CONTROL RODS (AVIM) 11-23.4

NOTE

Locking device serrations face each other. Key to locking device (-1) fits key slot in barrel.

g. Adjust length of control rods by turning rod end clevis into barrel. Rod lengths for each control rod, measured between holes that are farthest apart, are as follows:

(1) lateral 16-1/16 inches

(2) aft 15-3/4 inches

(3) forward 15-3/4 inches

h. Tighten jamnut handtight. Final adjustment will be made when control rod is installed in helicopter.

i. Touch up paint with epoxy primer, Item 150, Appendix D.

11-24 YAW LEVER AND SUPPORT (STATION 301) - REPLACE 11-24

PARAGRAPH BREAKDOWN

11-24.1 REPLACE YAW LEVER AND SUPPORT

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-155
- Cotter Pin, MS24665-370
- Lockwire, Item 203, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicator, MIL-I-18422
- Micrometer, GGG-C-105
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- PARA 11-1
- PARA 11-2

11-24.1 REPLACE YAW LEVER AND SUPPORT 11-24.1

REMOVE

a. Remove soundproofing in cabin ceiling, station 295 to 308.

b. Measure installed radial slot of pin by manually moving yaw shaft lever vertically (up and down). If any movement is found, do next step.

c. Measure diameter of pin where it contacts bearing using micrometer. Set micrometer near shoulder of pin to obtain basic diameter. **MAXIMUM ALLOWABLE WEAR IS 0.005 INCH.**

d. If maximum allowable wear is exceeded replace pin and bearing.

NOTE

Check for pin and bearing wear by doing the following steps.

e. Open main rotor pylon sliding cover.

f. Remove yaw push rod from between mixer and yaw lever (Figure 11-96, Sheet 1, Detail A).

g. Remove control rod from between yaw lever and forward quadrant lever (Figure 11-96, Sheet 2, Detail B).

h. Unbolt retaining plate from beam fitting. Carefully remove pin from fitting and yaw lever being careful not to loose washer(s) between fitting and yaw lever (Figure 11-96, Sheet 2, Detail C).

i. Remove nut and large washer from yaw lever stud. Unbolt support from airframe.

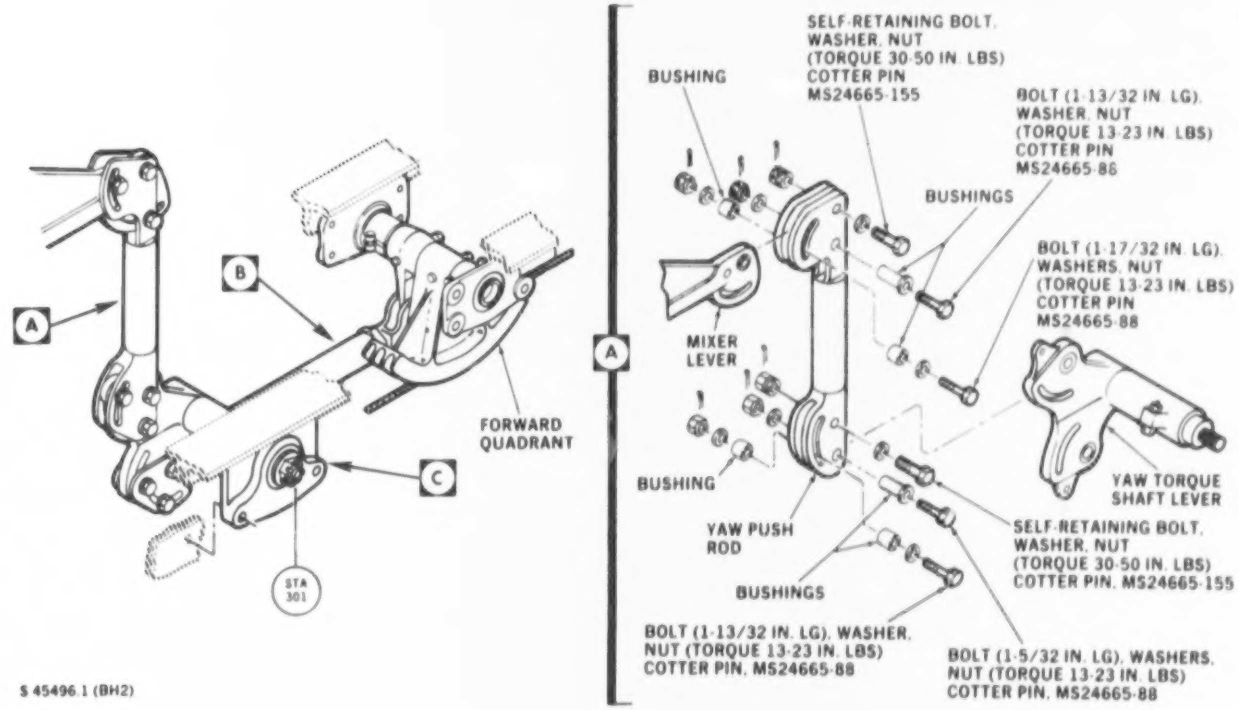

A
B
C
FORWARD QUADRANT
STA 301
S 45496.1 (BH2)
A
BUSHING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-13/32 IN. LG), WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BUSHINGS
BOLT (1-17/32 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
MIXER LEVER
YAW TORQUE SHAFT LEVER
BUSHING
YAW PUSH ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BUSHINGS
BOLT (1-13/32 IN. LG), WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN, MS24665-88
BOLT (1-5/32 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN, MS24665-88

FIGURE 11-96 (SHEET 1 OF 2)

11-24.1 REPLACE YAW LEVER AND SUPPORT 11-24.1

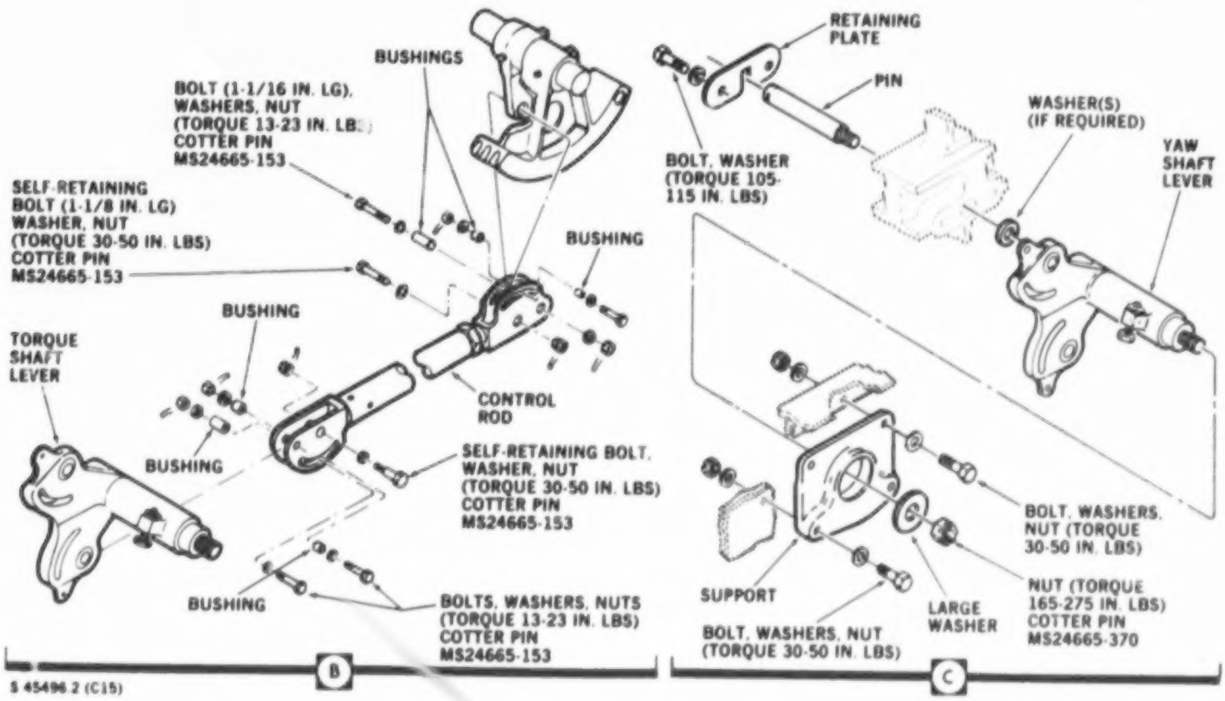

BUSHINGS
BOLT (1-1/16 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT (1-1/8 IN. LG) WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BUSHING
BUSHING
TORQUE SHAFT LEVER
CONTROL ROD
BUSHING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BUSHING
BOLTS, WASHERS, NUTS (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
B
S 45496.2 (C15)
RETAINING PLATE
PIN
BOLT, WASHER (TORQUE 105-115 IN. LBS)
WASHER(S) (IF REQUIRED)
YAW SHAFT LEVER
BOLT, WASHERS, NUT (TORQUE 30-50 IN. LBS)
SUPPORT
LARGE WASHER
NUT (TORQUE 165-275 IN. LBS) COTTER PIN MS24665-370
BOLT, WASHERS, NUT (TORQUE 30-50 IN. LBS)
C

FIGURE 11-96 (SHEET 2 OF 2)

j. Slide support from yaw lever and remove lever from between beam and airframe.

INSPECT

k. Inspect bearings in lever using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

INSTALL

WARNING

Deleted

NOTE

Install longest bolts in two bottom holes.

l. Slide replacement yaw lever up between beam fitting and airframe with long hub outboard. Slide support on lever hub and bolt support to airframe with bolts, washers, and nuts. **TORQUE NUTS TO 30 - 50 INCH-POUNDS** (Figure 11-96, Sheet 2, Detail C).

11-24.1 REPLACE YAW LEVER AND SUPPORT 11-24.1

WARNING

FLIGHT SAFETY PARTS

Verification of minimum gap between bearing and washer stack-up is a critical characteristic.

NOTE

Any combination of AN960, AN960L, or AN960LL washers up to a maximum of three may be used.

m. Install pin through beam fitting and into bearing in short hub of yaw shaft lever. Using feeler gage, measure gap between inner race of bearing and shoulder of pin. **MINIMUM GAP BETWEEN BEARING AND WASHER MUST BE 0.010 INCH.**

m.1. If gap is more than 0.028 inch, shim using washers.

TABLE 11-8

Deleted

WARNING

FLIGHT SAFETY PARTS

Verification of proper installation, torque, and safetying of retention plate and attaching bolts are critical characteristics.

n. If shimming is required, slide pin far enough out of fitting and yaw lever to install washers. Reinstall pin and install retaining plate over pin head using bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.** Lockwire, Item 203, Appendix D, bolts.

WARNING

FLIGHT SAFETY PARTS

Verification of torque and cotter pin installation are critical characteristics.

o. Install large washer and nut on lever stud. **TORQUE NUT TO 165 - 275 INCH-POUNDS.** Install cotter pin, MS24665-370.

p. Install long control rod between yaw lever and forward quadrant lever with adjustable end at quadrant lever (Figure 11-96, Sheet 2, Detail B).

q. Install self-retaining bolt and washers (under head) (PARA 11-1).

r. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

s. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

t. At forward quadrant lever, install bushing through slots in control rod and in quadrant lever. Install bolt (1-1/8 inch long), washers, and nuts. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

u. Install short bushings in slot on each side of rod end. Install bolt (1-1/16 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

v. At yaw lever end, install long bushing in control rod and slot in yaw lever. Install bolt, washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

w. Install short bushing in slot on each side of rod end. Install bolt, washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

11-24.1 REPLACE YAW LEVER AND SUPPORT 11-24.1

x. Install yaw push rod between mixer lever and yaw lever.

y. Install self-retaining bolt and washers (under head) (PARA 11-1).

z. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155 (Figure 11-96, Sheet 1, Detail A).

aa. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ab. At each end, install long bushings in rod ends and slots in levers. Install bolts, washers, and nuts. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-155.

ac. Install short bushings in each side of rod end slots. Install bolts, washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

ad. Do a rigging check on yaw system. Adjust control rod if necessary. Tighten jamnuts and lockwire, Item 203, Appendix D, to safety washer (PARA 11-2).

ae. Check area for cleanness and foreign material.

af. Install soundproofing in cabin ceiling.

ag. Close main rotor pylon sliding cover.

11-25 BELLCRANK, YAW LEVER, SUPPORTS - REPAIR (AVIM) 11-25

PARAGRAPH BREAKDOWN

11-25.1	REPLACE BELLCRANK BEARINGS (AVIM)
11-25.2	REPLACE YAW LEVER AND SUPPORT BEARINGS (AVIM)
11-25.3	REPLACE TORQUE SHAFT SUPPORT BEARING (AVIM)
11-25.4	REPLACE LEVER ASSEMBLY BEARINGS (AVIM)
11-25.5	REPAIR PILOT'S COLLECTIVE STICK SUPPORT (AVIM)
11-25.6	REPAIR PILOT'S COLLECTIVE STICK BELLCRANK SUPPORT (AVIM)
11-25.7	REPAIR COPILOT'S COLLECTIVE STICK SUPPORT (AVIM)
11-25.8	REPLACE COLLECTIVE BELLCRANK BEARINGS (AVIM)
11-25.9	REPLACE LONGITUDINAL BELLCRANK BEARINGS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

• One:	MOS 67T	- Tactical Transport Helicopter Repairer
• One:	MOS 68D	- Aircraft Powertrain Repairer
• One:	MOS 68G	- Aircraft Structural Repairer
• One:		- Assistant

MATERIALS/PARTS

- Abrasive Cloth, Item 7, Appendix D
- Acid Brush, Item 88, Appendix D
- Black Acrylic Lacquer, Item 191, Appendix D
- Cheesecloth, Item 98, Appendix D
- Degreasing Solvent, Item 131, Appendix D
- Dry Ice, Item 134, Appendix D
- Epoxy Primer, Item 150, Appendix D
- Gasket, 70400-02128-103
- Gasket, 70400-02128-105
- Loctite, Grade B, Item 208, Appendix D
- Loctite, Item 398, Appendix D
- Locking Compound, Item 402, Appendix D
- Machinery Towel, Item 227, Appendix D
- Masking Tape, Item 228, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Paint Remover, Item 255, Appendix D
- Primer, Item 277, Appendix D
- Rivet, MS20470AD2-6
- Sealing Compound, Item 312, Appendix D
- Sealing Compound, Item 315, Appendix D
- Stripper, Item 331, Appendix D
- Surface Primer, Grade T, Item 333, Appendix D
- Trichloroethylene, Item 376, Appendix D

11-25 BELLCRANK, YAW LEVER, SUPPORTS - REPAIR (AVIM) 11-25

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Airframe Repairer's Toolkit, SC 5180-99-CL-A02
- Arbor Press, OO-P-636
- Bolt, 1/4-inch diameter
- Bushing Replacement Kit, 87065
- Dial Indicator, MIL-I-18422
- Expansion Collet Knocker Puller, GGG-P-781
- Fluorescent Penetrant Inspection Kit, XMA101
- Nonmetallic Scraper, Locally-Made
- Pneumatic Drill, OO-D-691
- Powertrain Repairer's Toolkit, SC 5180-99-CL-A13
- Reamer Set, GGG-R-00180
- Sizing Block 1.596 - 1.597 Inch, Locally-Made
- Sizing Block 1.998 - 2.000 Inch, Locally-Made
- Sizing Block 0.875 - 0.876 Inch, Locally-Made
- Sizing Block 3.816 - 3.817 Inch, Locally-Made
- Staking Tool, 3-Point Impression
- Torque Wrench, 0 - 16 in. oz, TQ-SS-008A

REFERENCES

- PARA 2-5
- TM 43-0105
- TM 55-1500-204-25/1
- TM 55 1500-335-23
- TM 55-1500-322-24

11-25.1 REPLACE BELLCRANK BEARINGS (AVIM) 11-25.1

REMOVE

NOTE

Instructions are typical for all bellcrank bearings.

a. To remove a bearing, use one of these procedures:

(1) For single bearings that can be pushed out, use an arbor press, a step-type bearing removal tool, and a correct size anvil.

(2) For bearings that have to be pulled, use an expansion collet knocker puller.

(3) For double row bearings, with removable center spacer remove rivets (TM 55-1500-204- 25/1), and press out bearings and spacer, using an arbor press as in first method.

b. Before fluorescent penetrant inspection of bellcranks, strip paint from surface of bellcranks around bearing holes using stripper, Item 255, Appendix D.

c. Do a fluorescent penetrant inspection of bellcranks for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

INSPECT

d. Inspect bearings, MKSP4A-A1173, and MKSP4A-A2922, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.0025 INCH.**

e. Inspect bearings, MKP25B-A1173, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

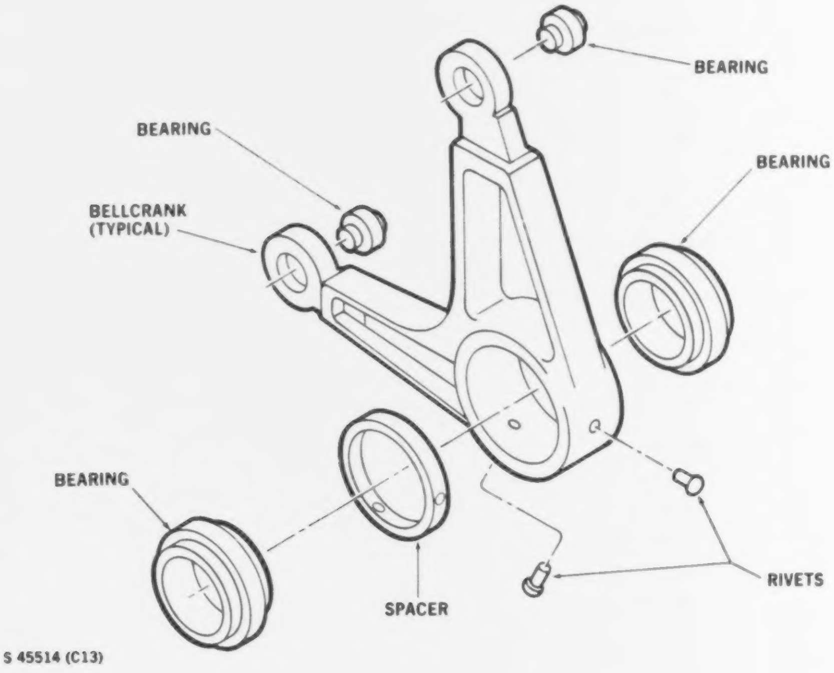


FIGURE 11-97

11-25.1 REPLACE BELLCRANK BEARINGS (AVIM) 11-25.1

INSTALL

f. If bellcrank has two bearings with spacer between, install spacer and rivets, MS20470AD2-6 (TM 55-1500-204-25/1).

CAUTION

Do not get solvent in bearings.

g. Clean bearing surfaces of bellcrank and outside diameter of bearings with degreasing solvent, Item 131, Appendix D.

CAUTION

Do not get primer in bearings.

NOTE

Surface primer and locking compound must be made by same manufacturer.

h. Apply a light coat of surface primer, Item 333, Appendix D, on outside diameter of bearings and on outside diameter of bellcrank.

i. Apply about a 1/16-inch bead of locking compound, Item 208, Appendix D, to leading edge of bearing outside diameter and entrance edge of bellcrank bore. Bead should be all around edge.

j. Within 10 minutes after applying locking compound, press bearings into bellcrank. Be careful not to get locking compound in bearings.

k. Using a cloth damp with degreasing solvent, Item 131, Appendix D, wipe surface of bearings clean of any locking compound. Be careful not to get solvent in bearings.

l. Allow at least 10 minutes for locking compound to dry before handling bellcrank.

NOTE

Locking compound exposed to air (external to mating surfaces) will not dry.

m. Do a rotational drag check of bearings as follows:

(1) For bearings with large IDs, use standard washers to fit on face of inside race, or make steel washers about 1/4 inch larger in diameter than ID of inside race. Drill a 1/4-inch-diameter hole in center of each washer.

(2) Install 1/4-inch-diameter bolt through bearing(s) and secure with nut.

(3) Using a torque wrench and socket, turn bolt head and measure rotational drag of bearing(s). If drag is greater than allowed in Table 11-9, replace bearing(s).

(4) Remove bolt and washers from bellcrank.

11-25.1 REPLACE BELLCRANK BEARINGS (AVIM) 11-25.1

Table 11-9

Bellcrank Part Number	Bearing	Maximum Rotational Drag Inch-Ounces
70400-01415-042, -043	All Bearings	2
70400-02170-043, -044	All Bearings	2
70400-02171-047, -048	MKSP4A-A1173 MKP25B-A1173	3 5
70400-02171-049, -050	MKSP4A-A2922 MKP25B-A1173	3 5
70400-02173-043, -044, -045	MKSP4A-A1173	3
	MKP25B-A1173	10
70400-02501-042, -043, -044, -045	All Bearings	2
70400-02502-042, -043, -044, -045	All Bearings	2
70400-02503-041, -042	MKSP4A-5A2922	2

11-25.2 REPLACE YAW LEVER AND SUPPORT BEARINGS (AVIM) 11-25.2

REMOVE

a. Using an arbor press, a step-type bearing remover and correct size anvil, press bearings from support and lever.

b. Using an expansion collet knocker-type puller, pull bearing from yaw lever.

INSPECT

c. Inspect lever bearings with a dial indicator (TM 55-1520-204-25/1). **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

d. Check all bearings for roughness, sticking, and seal damage (TM 55-1500-322-24). Replace worn or damaged bearings.

e. Strip paint from surface of parts around bearing holes using stripper, Item 331, Appendix D.

f. Do a fluorescent penetrant inspection of support and lever for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

INSTALL

CAUTION

Do not get solvent in bearings.

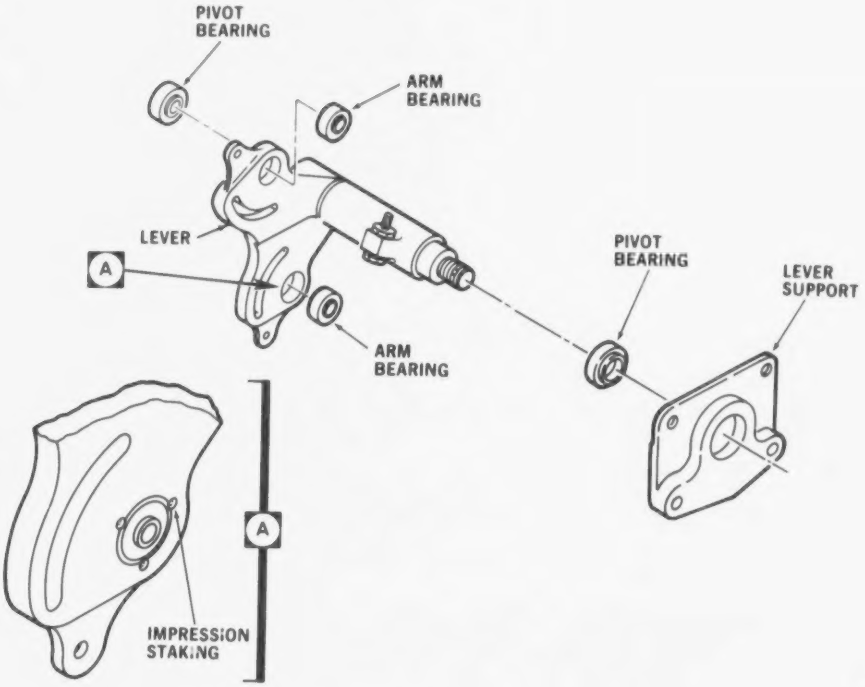

PIVOT BEARING
ARM BEARING
LEVER
A
PIVOT BEARING
LEVER SUPPORT
ARM BEARING
A
IMPRESSION STAKING
S 45530 (BH4)

FIGURE 11-98

11-25.2 REPLACE YAW LEVER AND SUPPORT BEARINGS (AVIM) 11-25.2

g. Clean yaw lever, support, and OD of bearings with machinery towel, Item 227, Appendix D, soaked in trichloroethane, Item 376, Appendix D.

h. Do not sandpaper new parts. If reworking a used lever or bearings, remove all old locking compound by lightly sanding lever ID and bearing OD with abrasive cloth, Item 7, Appendix D. Remove grime with clean cheesecloth, Item 98, Appendix D, moistened with trichloroethane, Item 376, Appendix D. Fold cloth wipe until no stain shows on cloth after each use. Do not touch treated surfaces.

NOTE

Surface primer and locking compound must be made by same manufacturer.

CAUTION

Do not get primer in bearings.

i. Apply a light coat of surface primer, Item 333, Appendix D, on OD of bearings and ID of lever or support. Allow primer to dry (15 - 30 minutes). Do not touch primed surfaces.

j. Apply an even coat of locking compound, Item 402, Appendix D, to bearing OD and lever bearing bore with a clean cotton swab or brush.

k. Press bearings into lever or supports. Be careful not to get locking compound in bearings. Bearings must be installed within 4 minutes of locking compound application; **IF NOT INSTALLED, REPEAT ENTIRE CLEANING, PRIMING, AND LOCKING COMPOUND APPLICATION PROCEDURE.**

l. Allow at least 15 minutes for locking compound to dry before handling lever or support. Allow at least 24 hours drying time before staking bearings.

m. Use a cloth damp with trichloroethane, Item 376, Appendix D, to wipe off locking compound squeezeout. Do not get solvent in bearings.

NOTE

Locking compound exposed to air will not dry.

n. Three-point impression stake arm bearings (Figure 11-98, Detail A). Stake on both sides. Do not stake over previous impressions (TM 55-1500-204-25/1).

o. Install a suitable bolt, washers, and nut through yaw lever arm bearings.

p. Do a rotational drag check of lever arm bearings using a torque wrench and socket. If drag is greater than 5 inch-ounces, replace bearing(s).

q. Check yaw lever pivot bearings (Figure 11-98) rotational drag. If drag is more than 8 inch-ounces, replace bearings.

11-25.3 REPLACE TORQUE SHAFT SUPPORT BEARING (AVIM) 11-25.3

REMOVE

NOTE

Replacement of collective, pitch, lateral, and yaw upper and lower support bearings are the same.

a. Using a nonmetallic scraper, remove gasket from support.

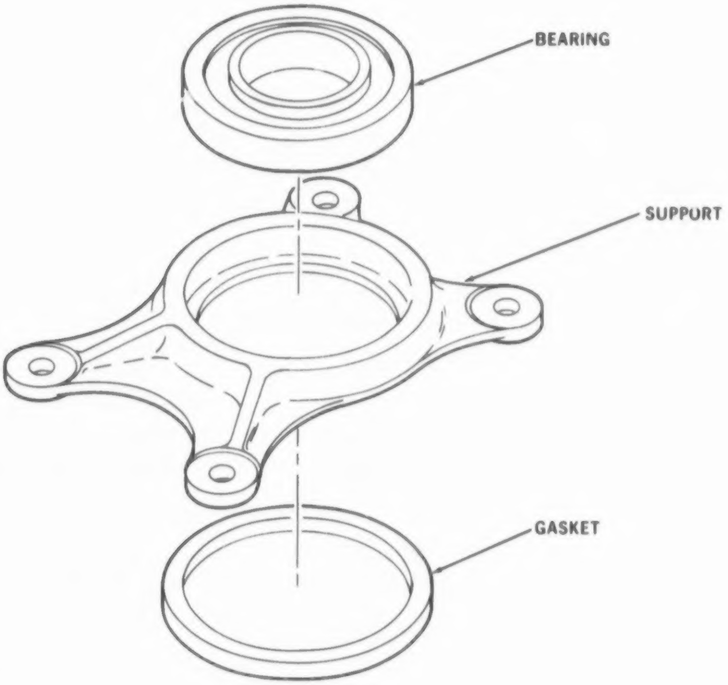
WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

b. Remove remaining sealant from support using a nonmetallic scraper and methyl ethyl ketone, Item 233, Appendix D.

c. Using an arbor press, carefully remove bearing from support.

d. Clean inside bore of support with trichloroethylene, Item 376, Appendix D.



S 67309 (C12)

FIGURE 11-99

11-25.3 REPLACE TORQUE SHAFT SUPPORT BEARING (AVIM) 11-25.3

INSTALL

CAUTION

When cleaning replacement bearing outer race, make sure no degreasing solvent enters bearing.

e. Clean outside surface of replacement bearing with degreasing solvent, Item 131, Appendix D.

f. Apply about a 1/16-inch bead of loctite, Item 398, Appendix D, to leading edge of bearing outside diameter and entrance edge of bearing bore. Bead shall be all around edge.

g. Within 10 minutes after applying loctite, press bearing into support. Make sure bearing is fully seated and there is no locking compound in bearing.

h. Allow 10 minutes for loctite to dry before handling support.

i. Do rotational drag check of bearing as follows:

(1) For bearings with large inside diameter, use standard washers to fit on face of inside race, or make steel washers about 1/4 inch larger in diameter than inside race. Drill a 1/4-inch-diameter hole in center of each washer.

(2) Install 1/4-inch-diameter bolt through washers and install nut.

(3) Using a torque wrench and socket, turn bolthead and measure rotational drag of bearing.

(4) **IF DRAG IS GREATER THAN 8 INCH-OUNCES, REPLACE BEARING.**

(5) Remove bolt, nut, and washers from bearing.

NOTE

When applying sealing compound on face of support, be careful not to get any sealing compound on bearing. Use gasket, 70400-02128-103, on support, 70400-02128-043, or gasket, 70400-02128-105, on support, 70400-02128-046.

j. Apply a light coat of sealing compound Item 312, Appendix D, on gasket mounting area of support and mounting face of gasket.

k. Allow sealing compound to dry for 10 minutes, and place gasket on support.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

l. Clean any extra sealing compound from support using a nonmetallic scraper and methyl ethyl ketone, Item 233, Appendix D.

11-25.4 REPLACE LEVER ASSEMBLY BEARINGS (AVIM) 11-25.4

REMOVE

NOTE

Replacement of collective, longitudinal, and directional lever assembly bearings are the same.

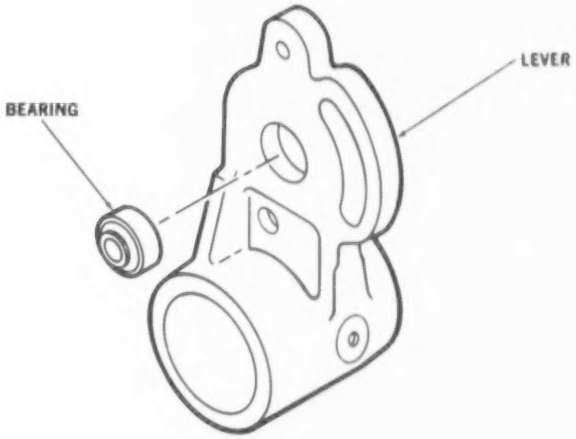
a. Using an arbor press, a step-type bearing remover, and correct size anvil, press bearings from lever.

INSPECT

b. Strip paint from surface of parts around bearing holes using stripper, Item 331, Appendix D.

c. Do a fluorescent penetrant inspection for cracks (TM 55-1500-335-23). **NO CRACK ALLOWED.**

d. Coat paint-stripped area with primer, Item 277, Appendix D. Touch up primed areas with paint (PARA 2-5).



S 76763 (C18)

FIGURE 11-100

11-25.4 REPLACE LEVER ASSEMBLY BEARINGS (AVIM) 11-25.4

INSTALL

CAUTION

Solvent will damage bearing. Do not get solvent in bearing.

e. Clean bearing surfaces of lever and OD of bearings with degreasing solvent, Item 131, Appendix D.

CAUTION

Primer will damage bearing. Do not get primer in bearing.

f. Apply a light coat of surface primer, Item 333, Appendix D, on OD of bearings and ID of lever.

g. Apply about a 1/16-inch bead of loctite, Item 208, Appendix D, to leading edge of bearing OD and entrance edge of bearing bore. Bead should be all around edge.

NOTE

Surface primer and loctite must be made by same manufacturer.

h. Within 10 minutes after applying loctite, press bearings into lever. Be careful not to get loctite in bearings.

i. Using a cloth damp with degreasing solvent, Item 131, Appendix D, wipe surface of bearings clean of any locking compound. Be careful not to get solvent in bearings.

j. Allow at least 10 minutes for loctite to dry before handling lever.

NOTE

Loctite exposed to air (external to mating surfaces) will not dry.

k. Do a rotational drag check of bearings as follows:

(1) For bearings with large inside diameters, use standard washers to fit on face of inside race, or make steel washers about 1/4 inch larger in diameter than ID of inside race. Drill a 1/4-inch-diameter hole in center of each washer.

(2) Install 3/16-inch-diameter bolt through bearing(s) and secure with nut.

(3) Using a torque wrench and socket, turn bolthead and measure rotational drag of bearing(s). If drag is greater than 2 inch-ounces, replace bearing(s).

11-25.5 REPAIR PILOT'S COLLECTIVE STICK SUPPORT (AVIM) 11-25.5

INSPECT

a. Inspect upper support bushings, NAS 537-5P-038 and NAS 538-5P-023, and lower support bushings, NAS 537-4P-038 and NAS 538-4P-023. **INSIDE RADIAL DIAMETER FOR UPPER SUPPORT BUSHINGS SHALL NOT BE OVER 0.4375-INCH ID. INSIDE RADIAL DIAMETER FOR LOWER SUPPORT BUSHINGS SHALL NOT BE OVER 0.3751-INCH ID.**

b. Using paint remover, Item 255, Appendix D, remove paint from support (TM 55 1500-335-23).

c. Do a fluorescent penetrant inspection of support for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

d. Inspect support for wear, elongated bushing or attachment holes. Replace support if necessary.

DISASSEMBLE

e. Using an arbor press and driver, remove bushings from support (TM 55-1500-204-25/1).

ASSEMBLE

f. Locally-make 1.596 - 1.597 inch and 1.998 - 2.000 inch sizing block.

WARNING

- To prevent injury to personnel, wear approved, insulated gloves when handling dry ice or chilled parts.
- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

g. To replace bushings in support, do this:

(1) Freeze replacement bushings in dry ice for at least 30 minutes.

(2) Clean bushing holes in support with methyl ethyl ketone, Item 233, Appendix D. Coat flanged bushings with primer, Item 277, Appendix D.

(3) Using an arbor press with bushings still wet with primer, press bushings into upper and lower flanges on support. Bushing flanges to be on inside of support flanges. (Figure 11-101, Detail A)

h. On upper flange, place a 1.596 - 1.597 inch size block on flanged bushing before installing plain bushing.

(1) Coat plain bushing with primer, Item 277, Appendix D. While still wet with primer, press plain bushing in upper support flange against sizing block.

(2) Remove sizing block. Measure space between ends of installed bushings. Clearance shall be 1.596 - 1.597 inches.

i. Line-ream bushing holes to 0.4370 - 0.4375-inch diameter.

11-25.5 REPAIR PILOT'S COLLECTIVE STICK SUPPORT (AVIM) 11-25.5

j. Place a 1.998 - 2.000 inch sizing block on flanged bushing before installing plain bushing.

(1) Coat plain bushing with primer, Item 277, Appendix D. While still wet with primer, press plain bushing in lower support flange against sizing block.

(2) Remove sizing block. Measure space between ends of installed bushings. Clearance shall be 1.998 - 2.000 inches. Line-ream bushing holes to 0.3745- to 0.3751-inch diameter.

k. Clean support with degreasing solvent, Item 131, Appendix D.

l. Using tape, Item 346, Appendix D, mask bushings.

m. Using epoxy primer, Item 150, Appendix D, and lacquer, Item 191, Appendix D, paint support (PARA 2-5).

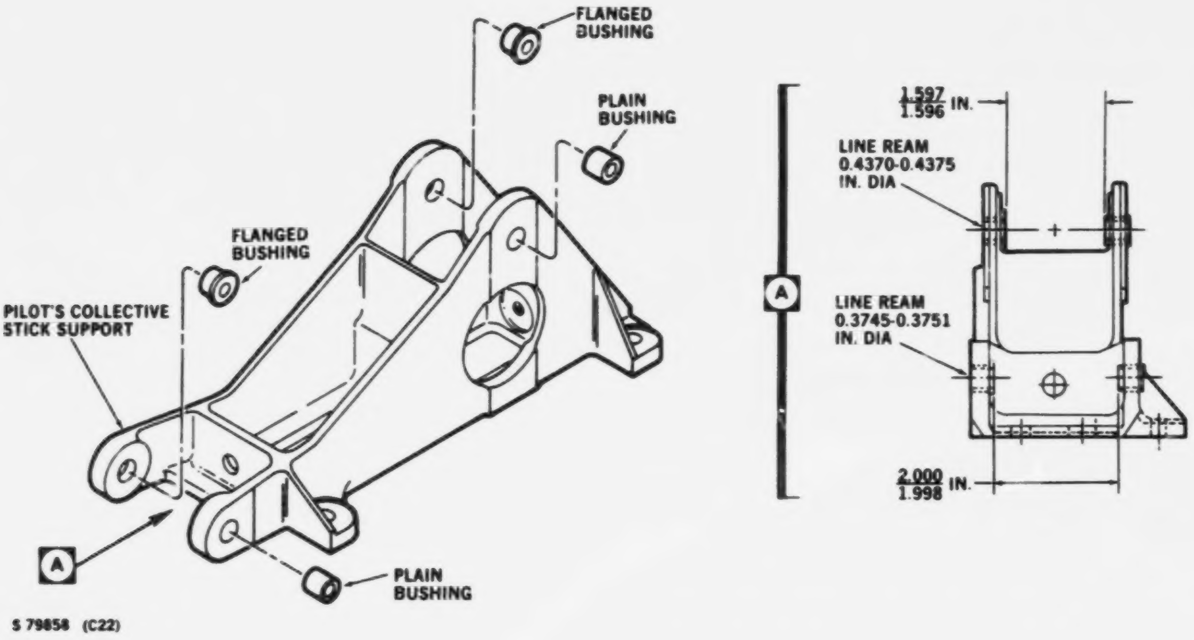

FLANGED BUSHING
PLAIN BUSHING
FLANGED BUSHING
PILOT'S COLLECTIVE STICK SUPPORT
A
PLAIN BUSHING
S 79858 (C22)
1.597/1.596 IN.
LINE REAM 0.4370-0.4375 IN. DIA
A
LINE REAM 0.3745-0.3751 IN. DIA
2.000/1.998 IN.

FIGURE 11-101

best copy available

11-25.6 REPAIR PILOT'S COLLECTIVE STICK BELLCRANK SUPPORT (AVIM) 11-25.6

INSPECT

a. Inspect bellcrank support bushings, NAS 538-4P31 and NAS 537-4P41. **INSIDE RADIAL DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.2505-INCH ID.**

b. Using paint remover, Item 255, Appendix D, remove paint from support (TM 43-0105).

c. Do a fluorescent penetrant inspection of support for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

d. Inspect support for wear and elongated bushing or attachment holes. Replace support if necessary.

DISASSEMBLE

e. Using an arbor press and driver, remove bushings from support (TM 55-1500-204-25/1).

ASSEMBLE

f. Locally-make 0.875 - 0.876 inch sizing block.

WARNING

- To prevent personal injury, wear approved gloves when handling dry ice or chilled parts.
- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

g. To replace bushings in bellcrank support, do this:

(1) Freeze replacement bushings in dry ice for at least 30 minutes.

(2) Clean bushing holes in support with methyl ethyl ketone, Item 233, Appendix D. Coat flanged bushings with primer, Item 277, Appendix D.

(3) With bushing still wet with primer, press bushing into clevis ear with an arbor press. Flange to be on inside of clevis (Detail A).

h. Place a 0.875 - 0.876 inch sizing block on flange of bushing before installing plain bushing.

(1) Coat plain bushing with primer, Item 277, Appendix D. While still wet with primer, press plain bushing in clevis ear against sizing block.

(2) Remove sizing block. Measure space between ends of installed bushings. Clearance shall be 0.875 - 0.876 inch.

i. Line-ream bushing holes to 0.2505- to 0.2495-inch diameter.

j. Clean support with degreasing solvent, Item 131, Appendix D.

k. Using masking tape, Item 228, Appendix D, mask bushings.

l. Using epoxy primer, Item 150, Appendix D, and lacquer, Item 191, Appendix D, paint support (PARA 2-5).

11-25.6 REPAIR PILOT'S COLLECTIVE STICK BELLCRANK SUPPORT (AVIM) 11-25.6

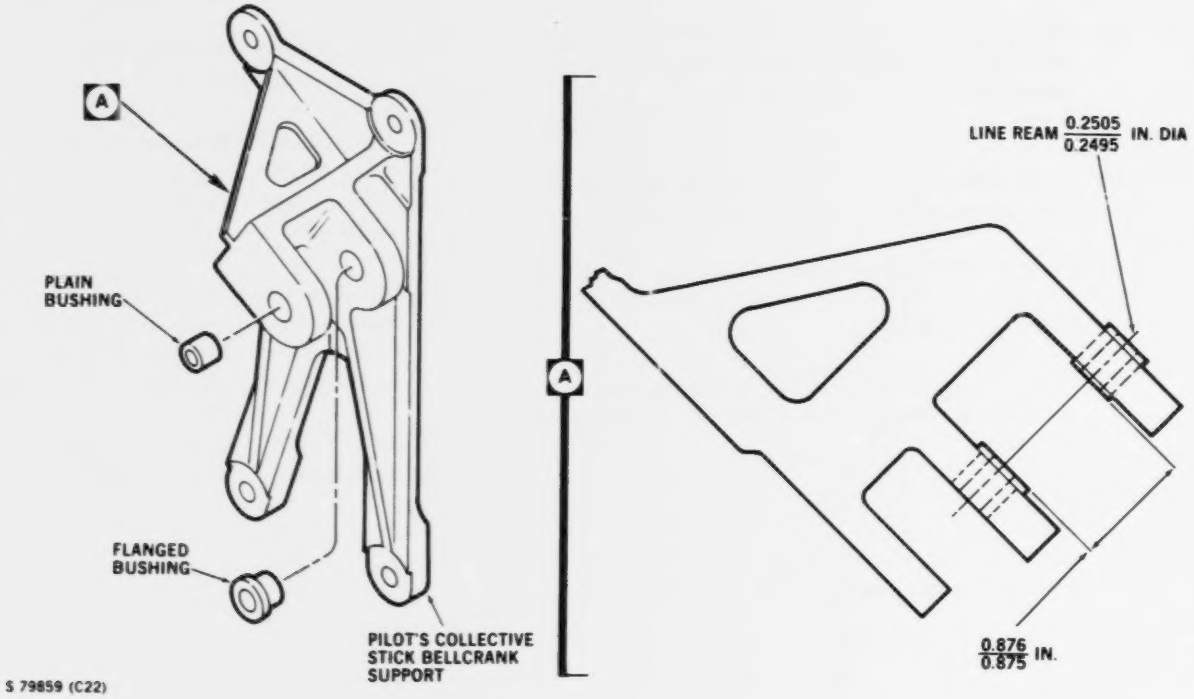

A
PLAIN BUSHING
FLANGED BUSHING
PILOT'S COLLECTIVE STICK BELLCRANK SUPPORT
S 79859 (C22)
A
LINE REAM 0.2505/0.2495 IN. DIA
0.876/0.875 IN.

FIGURE 11-102

11-25.7 REPAIR COPILOT'S COLLECTIVE STICK SUPPORT (AVIM) 11-25.7

INSPECT

a. Inspect support bushings, NAS 538-5P15 and SS 4045-5P43. **INSIDE RADIAL DIAMETER OF BUSHINGS SHALL NOT BE OVER 0.3130-INCH ID.**

b. Using paint remover, Item 255, Appendix D, remove paint from support (TM 43-0105).

c. Do a fluorescent penetrant inspection of support for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

d. Inspect support for wear and elongated bushing or attachment holes. Replace support if necessary.

DISASSEMBLE

e. Using an arbor press and driver, remove bushings from support (TM 55-1500-204-25/1).

ASSEMBLE

f. Locally-make sizing block, 3.816 - 3.817 inch.

WARNING

- To prevent personal injury, wear approved, insulated gloves when handling dry ice or chilled parts.
- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

g. To replace bushings in support, do this:

(1) Freeze replacement bushings in dry ice for at least 30 minutes.

(2) Clean bushing holes in support with methyl ethyl ketone, Item 233, Appendix D. Coat flanged bushings with primer, Item 277, Appendix D.

(3) Using an arbor press with bushing still wet with primer, press bushing into support flange. Bushing flange to be on inside of support flange (Figure 11-102, Detail A).

h. Place a 3.817 - 3.816 inch sizing block on flanged bushing before installing plain bushing.

(1) Coat plain bushing with primer, Item 277, Appendix D. While still wet with primer, press plain bushing in support ear against sizing block.

(2) Measure space between bushings. Clearance shall be 3.817 - 3.816 inches.

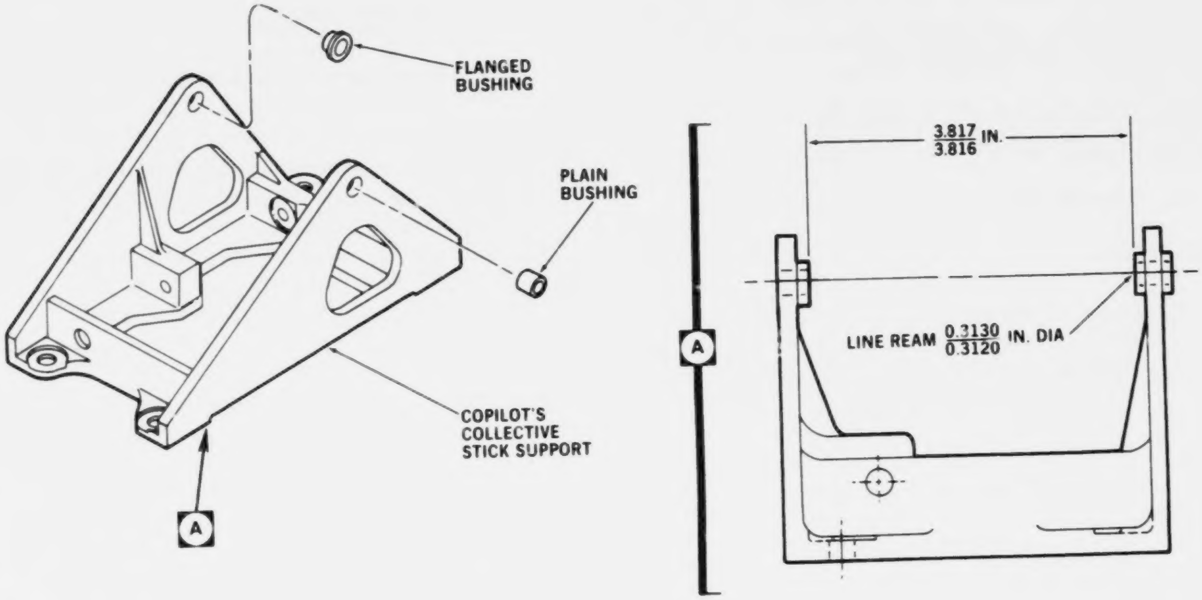
i. Line-ream bushing holes to 0.3120- to 0.3130-inch diameter.

j. Clean support with degreasing solvent, Item 131, Appendix D.

k. Using masking tape, Item 228, Appendix D, mask bushings.

l. Using epoxy primer, Item 150, Appendix D, and lacquer, Item 191, Appendix D, paint support (PARA 2-5).

11-25.7 REPAIR COPILOT'S COLLECTIVE STICK SUPPORT (AVIM) 11-25.7


FLANGED BUSHING
PLAIN BUSHING
COPILOT'S COLLECTIVE STICK SUPPORT
A
3.817/3.816 IN.
LINE REAM 0.3130/0.3120 IN. DIA
A

S 79860 (C22)

FIGURE 11-103

11-25.8 REPLACE COLLECTIVE BELLCRANK BEARINGS (AVIM) 11-25.8

REMOVE

a. Using an arbor press, a step-type bearing remover, and correct size anvil, press bearings from bellcrank legs.

b. Using an expansion collet knocker puller, pull journal bearings from bellcrank.

c. Remove sleeve from collective bellcrank.

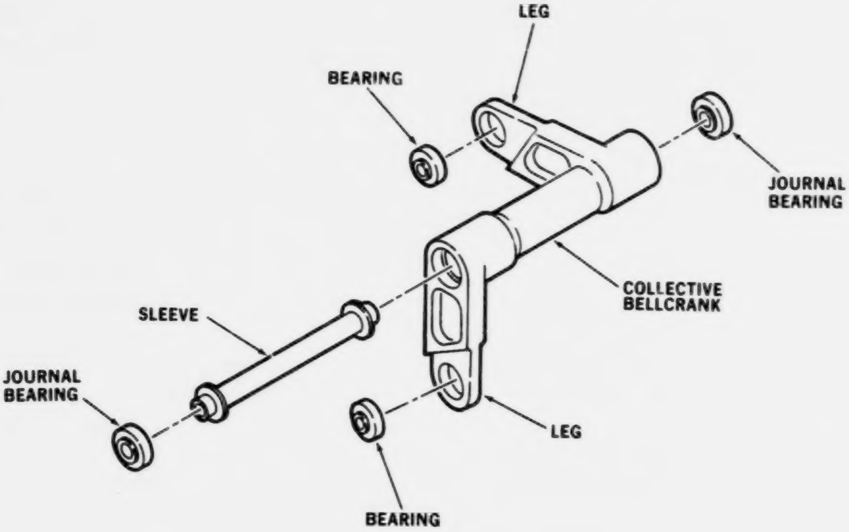
INSPECT

d. Inspect bellcrank bearings with a dial indicator (TM 55-1520-204-25/1). **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.0025 INCH.**

e. Check all bearings for roughness, sticking, and damage (TM 55-1500-322-24). Replace worn or damaged bearings.

f. Strip paint from surface of parts around bearing holes using stripper, Item 331, Appendix D.

g. Do a fluorescent penetrant inspection of bellcrank for cracks (TM 55-1500-335-23). **NO CRACKS ALLOWED.**


LEG
BEARING
JOURNAL BEARING
COLLECTIVE BELLCRANK
SLEEVE
JOURNAL BEARING
LEG
BEARING

S 126288 (BH2)

FIGURE 11-104

11-25.8 REPLACE COLLECTIVE BELLCRANK BEARINGS (AVIM) 11-25.8

INSTALL

CAUTION

Solvents and primer may damage bearings. Do not get solvent or primer in bearings.

h. Clean bellcrank and OD of bearings with machinery towel, Item 227, Appendix D, soaked with degreasing solvent, Item 131, Appendix D.

i. Do not sandpaper new parts. If reworking a used bearing, remove all old loctite by lightly sanding bellcrank ID and bearing OD with abrasive cloth, Item 7, Appendix D. Remove grime with clean cheesecloth, Item 98, Appendix D, moistened with degreasing solvent, Item 131, Appendix D. Fold cloth after each wipe until no stain shows on cloth after last wipe. Do not touch treated surfaces.

NOTE

Surface primer and loctite must be made by same manufacturer.

j. Apply a light coat of surface primer, Loctite, Item 211, Appendix D, on OD of bearings and ID of bellcrank. Allow primer to dry (15 - 30 minutes). Do not touch primed surfaces.

k. Apply an even coat of locking compound, Item 402, Appendix D, to bearing OD and bellcrank bearing bore with an acid brush, Item 88, Appendix D.

l. Press bearings into bellcrank legs. Be careful not to get loctite in bearings. Bearings must be installed within 4 minutes of loctite application; **IF NOT INSTALLED, REPEAT ENTIRE CLEANING, PRIMING, AND LOCTITE APPLICATION PROCEDURE.**

m. Install sleeve into bellcrank assembly.

n. Press journal bearings into bellcrank within 4 minutes of loctite application; **IF NOT INSTALLED, REPEAT ENTIRE CLEANING, PRIMING, AND LOCTITE PROCEDURE.**

o. Allow at least 15 minutes for loctite to dry before handling bellcrank.

p. Using a cloth damp with degreasing solvent, Item 131, Appendix D, wipe parts clean of loctite squeeze out. Be careful not to get solvent in bearings.

NOTE

Loctite exposed to air will not dry.

q. Install a suitable bolt, washers, and nut through collective bellcrank bearings.

r. Do a rotational drag check of bearings using a torque wrench and socket. If drag is greater than 2 inch-ounces at 70° - 90°F, replace bearing(s).

11-25.9 REPLACE LONGITUDINAL BELLCRANK BEARINGS (AVIM) 11-25.9

REMOVE

a. Using an arbor press, a step-type bearing remover and correct size anvil, press leg bearings from bellcrank.

b. Using correct size puller, pull pivot bearings from bellcrank.

c. Remove bushing from bearing using puller.

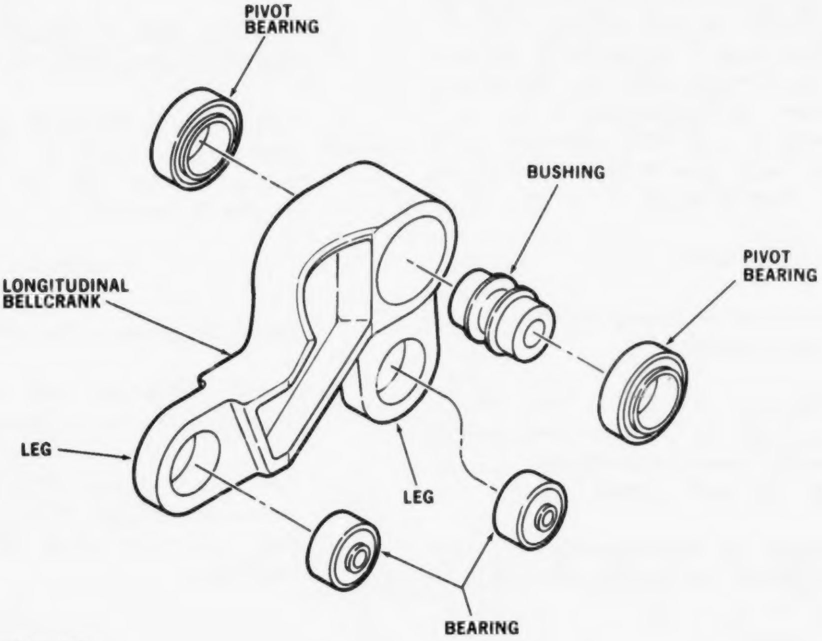
d. Inspect bushing for scoring and wear. Replace if worn or damaged.

INSPECT

e. Inspect bearings with a dial indicator, (TM 55-1520-204-25/1). **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.0005 INCH.**

f. Check all bearings for roughness, sticking, and seal damaged (TM 55-1500-322-24). Replace worn or damaged bearings.

g. Strip paint from surface of parts around bearing holes using stripper, Item 331, Appendix D.



S 126289 (BH2)

FIGURE 11-105

11-25.9 REPLACE LONGITUDINAL BELLCRANK BEARINGS (AVIM) 11-25.9

h. Do a fluorescent penetrant inspection of bellcrank (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

INSTALL

CAUTION

Solvents and primer may damage bearings. Do not get solvent on primer in bearings.

i. Clean longitudinal bellcrank and OD of bearings with rag soaked with degreasing solvent, Item 131, Appendix D.

j. Do not sandpaper new parts. If reworking a used bellcrank or bearings, remove all old locking compound by lightly sanding lever ID and bearing OD with abrasive cloth, Item 7, Appendix D. Remove grime with clean cheesecloth, Item 98, Appendix D, moistened with degreasing solvent, Item 131, Appendix D. Fold cloth wipe after each wipe until no stain shows on cloth after last wipe. Do not touch treated surfaces.

NOTE

Surface primer and locking compound must be made by same manufacture.

k. Apply a light coat of Loctite, Item 211, Appendix D, on OD of bellcrank leg bearings and ID of bellcrank. Allow primer to dry (15 - 30 minutes). Do not touch primed surfaces. If any break occurs in the primer coat, reclean, and reprime.

l. Apply an even coat of locking compound, Item 402, Appendix D, to leg bearings OD and bellcrank bearing bore with a clean acid brush, Item 88, Appendix D.

m. Press bellcrank leg bearings into bellcrank. Be careful not to get locking compound in bearings. Bearings must be installed within 4 minutes of locking compound application. **IF NOT INSTALLED, REPEAT ENTIRE CLEANING, PRIMING, AND LOCKING COMPOUND APPLICATION PROCEDURE.**

n. Press pivot bearing into bushing using an arbor press.

o. Apply a light coat of surface primer, Loctite, Item 211, Appendix D, on OD of pivot bearings and ID of bellcrank. Allow primer to dry (15 - 30 minutes). If any break occurs in the primer coat, reclean, and reprime.

p. Apply an even coat of locking compound Item 402, Appendix D, to pivot bearings OD and pivot bearing bore with a clean acid brush, Item 88, Appendix D.

11-25.9 REPLACE LONGITUDINAL BELLCRANK BEARINGS (AVIM) 11-25.9

q. Press pivot bearing with bushing into bellcrank housing using an arbor press. Be careful not to get locking compound in bearing. Bearing must be installed within 4 minutes of locking compound application. **IF NOT INSTALLED, REPEAT ENTIRE CLEANING, PRIMING, AND LOCKING COMPOUND APPLICATION PROCEDURE.**

r. Allow at least 15 minutes for locking compound to dry before handling bellcrank.

s. Press pivot bearing into reverse side of bellcrank using an arbor press. Be careful not to get locking compound in bearing. Bearing must be installed within 4 minutes of locking compound application. **IF NOT INSTALLED, REPEAT ENTIRE CLEANING, PRIMING, AND LOCKING COMPOUND APPLICATION PROCEDURE.**

t. Allow at least 15 minutes for locking compound to dry before handling lever or support. Allow at least 24 hours drying time before staking bearings.

u. Using a cloth damp with degreasing solvent, Item 131, Appendix D, wipe parts clean of locking compound squeezeout. Be careful not to get solvent in bearings.

NOTE

Locking compound exposed to air will not dry.

v. Three-point impression stake bearings (TM 55-1520-204-25/1).

w. Install a suitable bolt, washers, and nut through bellcrank.

x. Do a rotational drag check of bellcrank bearings, using a torque wrench and socket. If drag is greater than 2 inch-ounces, replace bearing(s).

11-26 FORWARD QUADRANT AND SUPPORTS - REPLACE 11-26

PARAGRAPH BREAKDOWN

11-26.1 REPLACE FORWARD QUADRANT AND SUPPORTS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-155
- Lockwire, Item 203, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 2-32
- PARA 11-2
- PARA 11-27
- PARA 11-28

11-26.1 REPLACE FORWARD QUADRANT AND SUPPORTS 11-26.1

REMOVE

a. Turn off all electrical and hydraulic power.

b. Remove soundproofing from cabin ceiling, station 311 (PARA 2-32).

c. Remove tail gear box front fairing.

d. Release spring cylinder tension on tail rotor quadrant. Use alternate method procedure (PARA 11-28).

e. Remove access panel on tail cone to get to control cable quick-disconnects.

WARNING

Uncontrolled release of spring may cause injury to personnel or damage to equipment. Be sure tension on tail rotor quadrant has been relaxed before disconnecting spring cylinders (PARA 11-28).

f. Disconnect both cables at quick-disconnects in tail cone.

NOTE

Keep bolts and bushings together, as an assembly. Bushings are of different dimensions.

g. Unbolt control rod between forward quadrant and torque shaft (Figure 11-105, Detail A).

h. Remove inboard washer. Remove cable retainer from airframe (Figure 11-105, Detail B). Slide cables and collars from quadrant. Remove collars from cable.

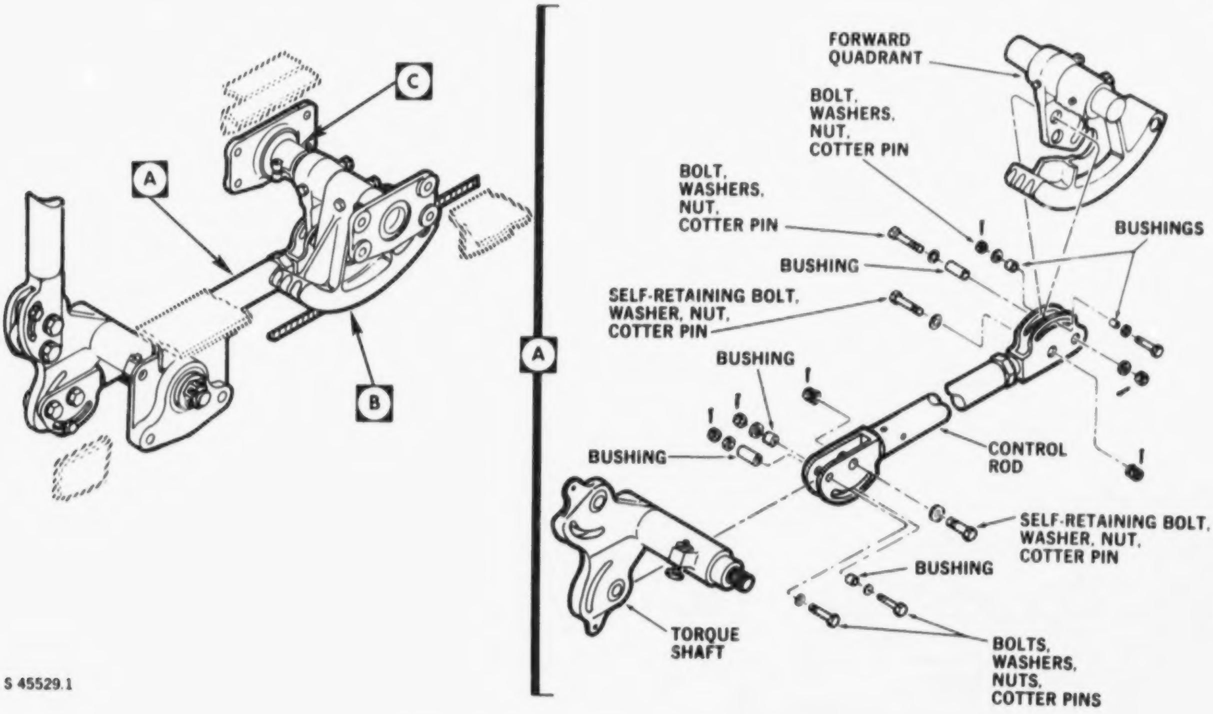
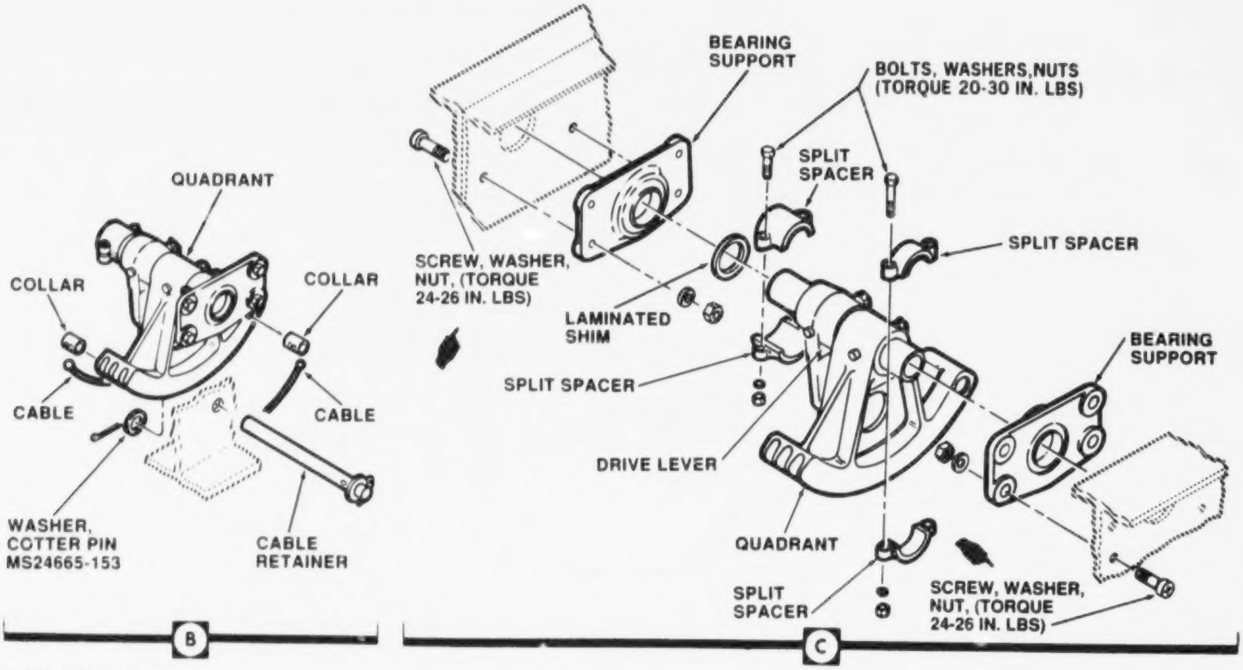

C
A
B
S 45529.1
A
FORWARD QUADRANT
BOLT, WASHERS, NUT, COTTER PIN
BOLT, WASHERS, NUT, COTTER PIN
BUSHINGS
BUSHING
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN
BUSHING
BUSHING
CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN
BUSHING
TORQUE SHAFT
BOLTS, WASHERS, NUTS, COTTER PINS

FIGURE 11-105 (SHEET 1 OF 3)


QUADRANT
COLLAR
COLLAR
CABLE
CABLE
WASHER, COTTER PIN MS24665-153
CABLE RETAINER
B
BEARING SUPPORT
BOLTS, WASHERS,NUTS (TORQUE 20-30 IN. LBS)
SPLIT SPACER
SPLIT SPACER
SCREW, WASHER, NUT, (TORQUE 24-26 IN. LBS)
LAMINATED SHIM
SPLIT SPACER
BEARING SUPPORT
DRIVE LEVER
QUADRANT
SPLIT SPACER
SCREW, WASHER, NUT, (TORQUE 24-26 IN. LBS)
C

UH60A-45592.2 (BH6)

FIGURE 11-105 (SHEET 2 OF 3)

i. Unbolt both split spacers from quadrant shaft (Figure 11-105, Detail C).

j. Unbolt inboard and outboard bearing supports from airframe. Remove bearing supports and quadrant from between airframe beams.

NOTE

Forward quadrant is a matched assembly. Lever, cable quadrant and shaft is replaced as an assembled unit.

k. Remove laminated shim from shaft.

INSTALL

l. Turn off all electrical and hydraulic power.

m. Install adjustable rod end of control rod on forward quadrant lever (PARA 11-27).

n. Install quadrant assembly between airframe beams with quadrant outboard. Slide supports on quadrant shaft with mounting bosses facing out (Figure 11-105, Detail C).

o. Bolt supports to airframe with screws, washers, nuts. (Nuts on inside.) **TORQUE NUTS TO 24 - 26 INCH-POUNDS.**

p. Install short split spacer on shaft between quadrant and outboard support. Install long split spacer on shaft. Do not torque nuts now.

q. Push long split spacer, shaft, lever, and quadrant toward outboard support. Using feeler gage, measure gap between inboard support and long spacer.

11-26.1 REPLACE FORWARD QUADRANT AND SUPPORTS 11-26.1

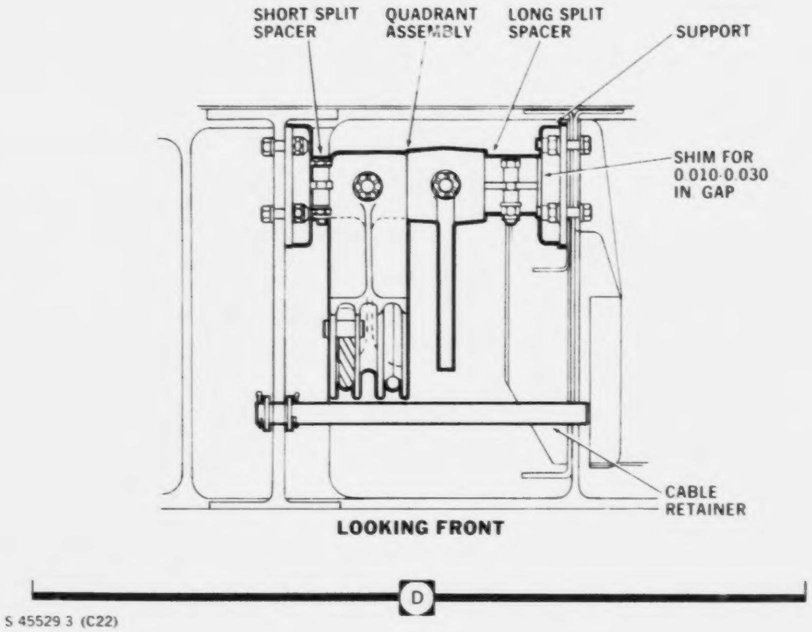


FIGURE 11-105 (SHEET 3 OF 3)

r. Remove split spacers, unbolt supports, and remove forward quadrant from between airframe beams. Remove inboard support from shaft.

s. Peel shim to a thickness of 0.010 - 0.030 inch less than measurement of gap between inboard support and long spacer. Allow 0.010 - 0.030 inch end play between split spacers and supports (Figure 11-105, Detail D).

t. Install shim and inboard support on shaft. Install quadrant assembly and supports between airframe beams. Bolt supports to beams. **TORQUE NUTS TO 24 - 26 INCH-POUNDS.**

u. Install long split spacer between shim and lever. Push spacer toward lever and outboard support. **TORQUE NUTS ON BOTH SPLIT SPACERS TO 20 - 30 INCH-POUNDS.** Check for 0.010- to 0.030-inch end play. Readjust shim if necessary.

v. Install control rod between torque shaft and quadrant (PARA 11-27).

w. Install cables in collars. Install collars and cable in quadrant. Be sure cables are in quadrant grooves, then install cable guard retainer. Put washer on retainer inside of outboard beam as retainer is being installed. Install cotter pin, MS24665-153 (Figure 11-105, Detail B).

x. In tail cone, connect both cables at quick-disconnects. Lockwire, Item 203, Appendix D, disconnects.

11-26.1 REPLACE FORWARD QUADRANT AND SUPPORTS 11-26.1

y. Bolt tail rotor quadrant spring cylinders to supports per alternate method procedures (PARA 11-28).

z. Do a rigging check of yaw flight control system (PARA 11-2).

aa. Be sure all rigging pins are removed and electrical and hydraulic power is off.

ab. Check area for cleanness and foreign material.

ac. Install access panel on tail cone. Install tail gear box fairing.

ad. Install soundproofing panel in cabin ceiling at station 311 (PARA 2-32).

11-27 FLIGHT CONTROL RODS, BELLCRANKS, LEVERS - REPLACEMENT 11-27

PARAGRAPH BREAKDOWN

11-27.1 GENERAL INFORMATION

11-27.2 CONTROL RODS - COCKPIT

11-27.3 CONTROL RODS - INSIDE CABIN

11-27.4 CONTROL RODS - TORQUE SHAFTS TO SERVOS

11-27.5 CONTROL RODS - SERVOS TO MIXER

11-27.6 CONTROL RODS - MIXER TO PRIMARY SERVOS

11-27.7 CONTROL RODS - MIXER TO FORWARD QUADRANT

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE

11-27.9 PUSHROD - TAIL ROTOR SERVO TO TAIL ROTOR QUADRANT

11-27.10 BELLCRANKS AND LEVERS IN COCKPIT

11-27.11 BELLCRANKS AND BELLCRANK SUPPORT IN CABIN

11-27.12 LINKS AND LEVERS UPPER CABIN

11-27.13 BELLCRANKS/WALKING BEAM - MAIN GEAR BOX BRIDGE

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Corrosion Preventive Compound, Item 120, Appendix D
- Cotter Pin, MS24665-88
- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-155
- Cotter Pin, MS24665-172
- Cotter Pin, MS24665-374
- Cotter Pin, MS24665-376
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Crowsfoot Attachement, GGG-C-001507
- Dial Indicator, MIL-I-18422
- Inside Micrometer, GGG-C-105
- Nonmetallic Punch
- Rigging Kit, 70700-20389-042
- Rod, 3/16' inch diameter
- Socket Key, A-A-2473
- Socket Wrench Attachment, GGG-W-641
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

11-27 FLIGHT CONTROL RODS, BELLCRANKS, LEVERS - REPLACEMENT 11-27

- Torque Wrench, 700 - 1600 in. lbs, GGG-W-00686
- Torque Wrench, 0 - 300 ft lbs, GGG-W-00686
- Torque Wrench, 0 - 600 ft lbs, GGG-W-00686
- Wooden Blocks

REFERENCES

- PARA 1-6.3
- PARA 2-18
- PARA 2-32
- PARA 2-43
- PARA 11-1
- PARA 11-2
- PARA 11-3
- PARA 11-5
- PARA 11-23
- PARA 11-27
- PARA 11-28
- PARA 11-32
- TM 55-1520-237-T

11-27.1 GENERAL INFORMATION 11-27.1

INTRODUCTION

a. Rigging Kit 70700-20389-042, consists of these pins/blocks which are used in checking helicopter rigging.

TABLE 11-10

PIN PART NO.	LOCATION	INCH DIA	INCH LENGTH	NO. NEEDED
70700-20380-065	PITCH CYCLIC STICKS	1/4	4	2
70700-20380-066	ROLL CYCLIC STICKS	1/4	4	2
70700-20380-042	YAW PEDALS ADJUSTOR	5/16	6	2
70700-20380-043	TORQUE SHAFTS	5/16	4	4
70700-20380-044	PITCH/ROLL ASSYS	5/16	1-1/2	2
70700-20380-046	MIXER, RH	5/16	36	1
70700-20380-068	MIXER, LH YAW	5/16	12	1
70700-20380-071	TAIL ROTOR SERVO	1/4	6	1
70700-20378-103	DAMPER BLOCKS	-	-	4
70700-20380-062	YAW SERVO	PIN	-	1
70700-20380-062	COLLECTIVE SERVO	PIN	-	1

b. Install rigging pins using procedures in PARA 11-2.

CAUTION

Each self-retaining bolt used for attaching control rods and links in the flight control system has a ring that expands above the diameter of the bolt. This means the bolt has to be tapped in or out when it is removed or installed. Do not install a self-retaining bolt in a rod end just to keep the bolt with the rod. It is possible to damage the bearing and rod end by popping out the bearing, using the force needed to install the bolt. At normal installation the bearing is restrained inside a clevis.

NOTE

Make sure self-retaining element on bolt is completely out of bolthole before installing nut and cotter pin.

c. When replacing control rods it may be necessary to move controls to allow clearance when removing attaching bolts.

11-27.1 GENERAL INFORMATION 11-27.1

d. If hydraulic power is not available, disconnect input control rods between torque shafts and servos on upper deck (PARA 11-27.4).

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	–
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

e. Connect a source of hydraulic power to backup hydraulic system or connect a source of external electrical power and run backup hydraulic system. Or run APU and run backup hydraulic system (PARA 1-6.3).

11-27.2 CONTROL RODS - COCKPIT 11-27.2

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

NOTE

For application of hydraulic and electrical power to move flight controls, refer to PARA 11-27.1.

REPLACE PILOT'S YAW PEDALS AND ADJUSTOR CONTROL RODS

a. Remove boots from yaw pedals and pedal adjustor (PARA 11-3).

b. Remove toe pedals from supports (PARA 11-3).

c. Remove boots from cyclic stick (PARA 11-5).

d. Remove cockpit floor access panels (PARA 2-18).

e. Unbolt and remove yaw pedal control rods from between adjustor levers and pedal supports (Figure 11-107, Sheet 2, Detail A).

f. Remove lower right window when removing pilot's directional control rod (PARA 2-18).

g. Unbolt and remove directional control rod from between adjustor long lever and bellcrank through window frame.

h. Install replacement directional control rod between bellcrank and adjustor long lever through window frame.

i. Install self-retaining bolt and washers (under head) (PARA 11-1).

j. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

k. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

l. Check yaw pedal control rod length. **LENGTH BETWEEN HOLE CENTERS MUST BE 10.81 - 10.87 INCHES.** Loosen jamnut and adjust as required. **TIGHTEN JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

NOTE

Helicopters prior to serial No. 77-22723 have nonadjustable control rods. **REPLACE RODS IF LENGTH BETWEEN HOLE CENTERS IS NOT 10.65 - 10.71 INCHES.**

m. Install replacement yaw pedal control rods (between adjustor levers and pedal supports).

n. Install self-retaining bolt and washers (under head) (PARA 11-1).

o. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

p. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

q. If removed, replace right window (PARA 2-18).

r. Install boots from yaw pedals and pedal adjustor (PARA 11-3).

s. Install toe pedals from supports (PARA 11-3).

11-27.2 CONTROL RODS - COCKPIT 11-27.2

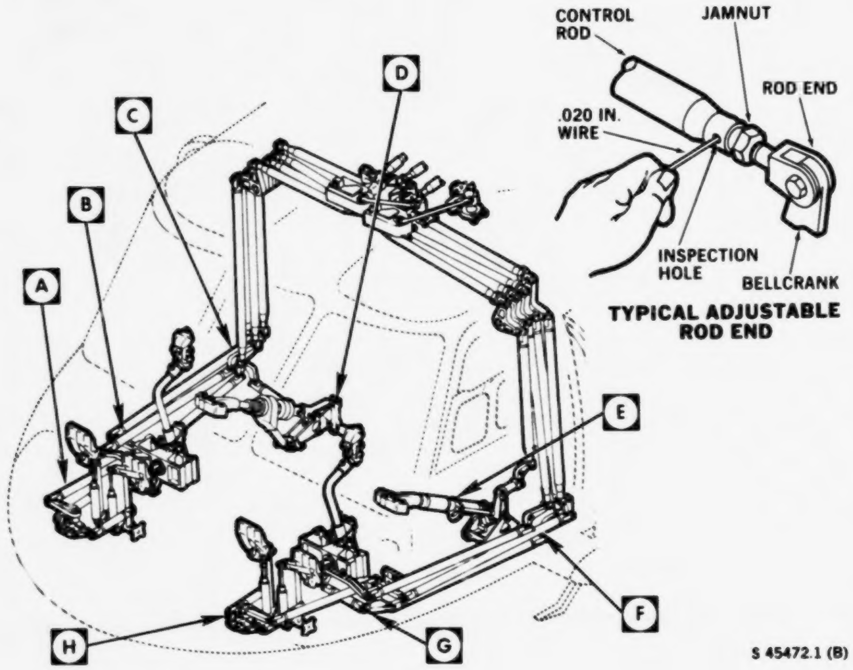

CONTROL ROD
JAMNUT
ROD END
.020 IN. WIRE
INSPECTION HOLE
BELLCRANK
TYPICAL ADJUSTABLE ROD END
A
B
C
D
E
F
G
H
S 45472.1 (B)

FIGURE 11-107 (SHEET 1 OF 8)

t. Install boots from cyclic stick (PARA 11-5).

u. Install cockpit floor access panels (PARA 2-18).

REPLACE PILOT'S DIRECTIONAL AND CYCLIC CONTROL RODS

v. Remove boots from cyclic stick (PARA 11-5).

w. Remove cockpit floor access panels (PARA 2-18).

x. Remove soundproofing panels right side of cabin to gain access to right lower support (PARA 2-32).

y. Unbolt push-pull rod from cyclic stick, yoke bellcrank and lateral bellcrank on frame.

z. Unbolt lateral, pitch, or yaw control rods from bellcranks at cyclic stick and bellcranks in lower support (Details B and C).

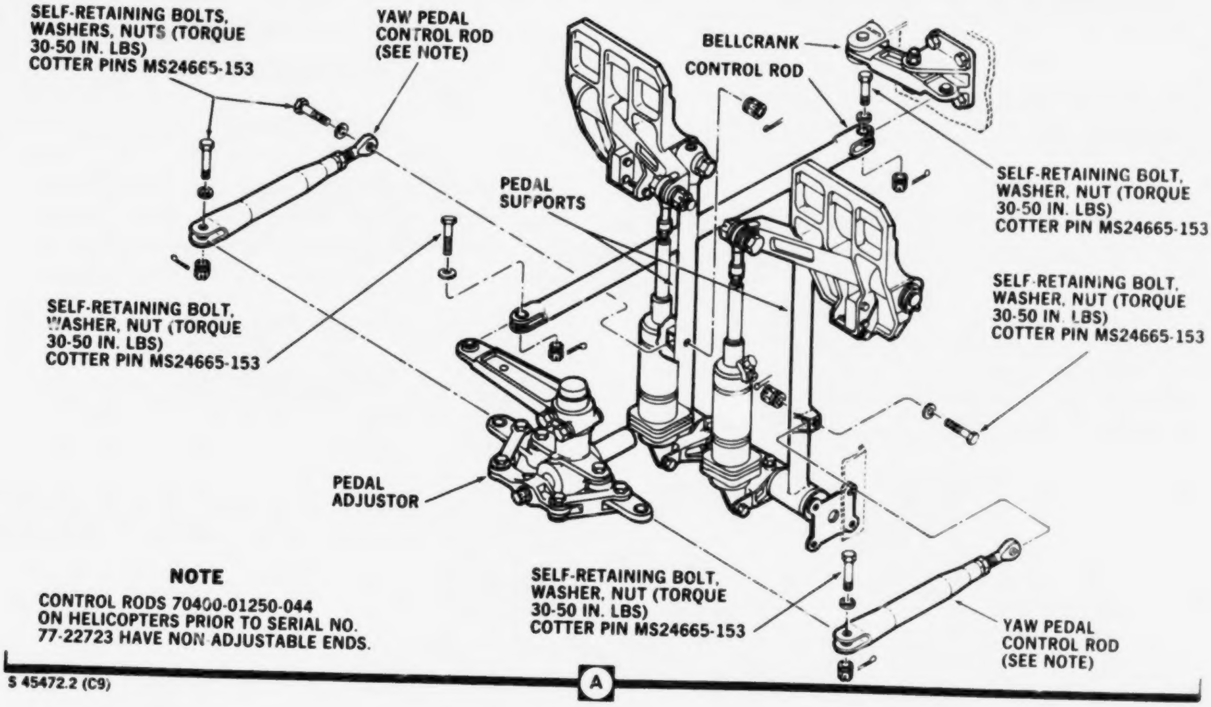
aa. Remove them to rear, through cabin.

ab. Adjust replacement yaw control rod to 45.44 inches between hole centers. **TIGHTEN JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

WARNING

Directional control movement will be limited if yaw control rod is improperly installed. Control rod bolt will chafe control rod trough.

ac. Install yaw control rod with plain-bushing side-up.


SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
YAW PEDAL CONTROL ROD (SEE NOTE)
BELLCRANK
CONTROL ROD
PEDAL SUPPORTS
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PEDAL ADJUSTOR
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
YAW PEDAL CONTROL ROD (SEE NOTE)
S 45472.2 (C9)
A

NOTE

CONTROL RODS 70400-01250-044 ON HELICOPTERS PRIOR TO SERIAL NO. 77-22723 HAVE NON-ADJUSTABLE ENDS.

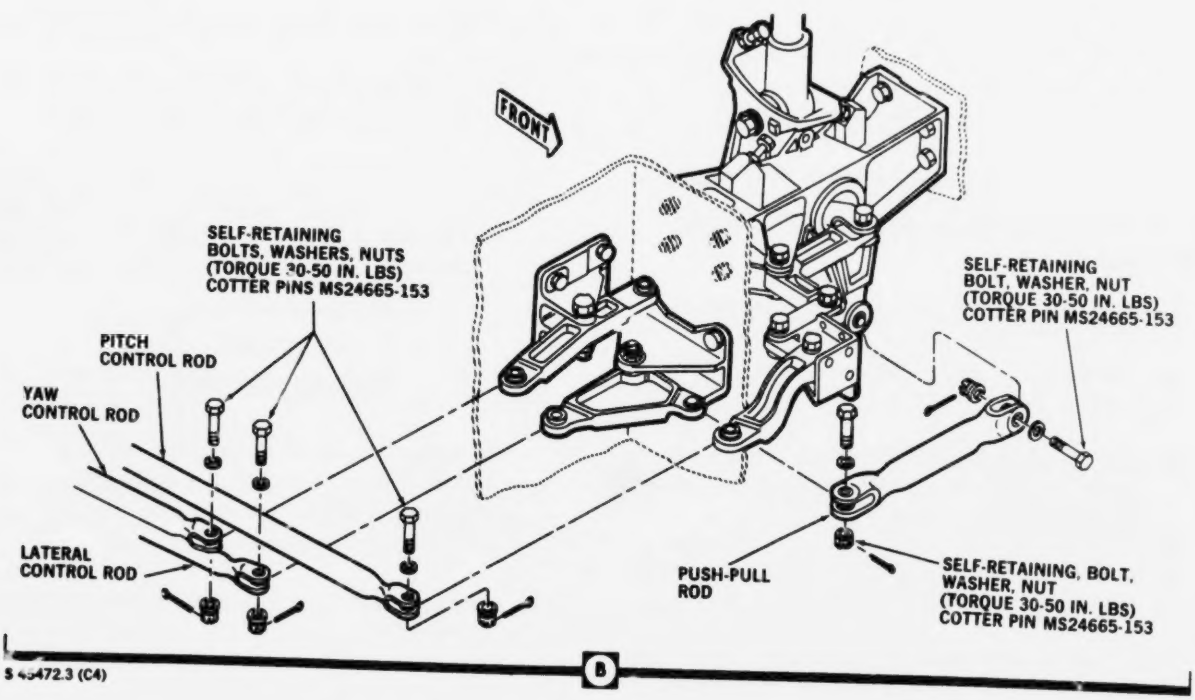

FRONT
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
PITCH CONTROL ROD
YAW CONTROL ROD
LATERAL CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PUSH-PULL ROD
SELF-RETAINING, BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
S 45472.3 (C4)
B

FIGURE 11-107 (SHEET 2 OF 8)

11-27.2 CONTROL RODS - COCKPIT 11-27.2

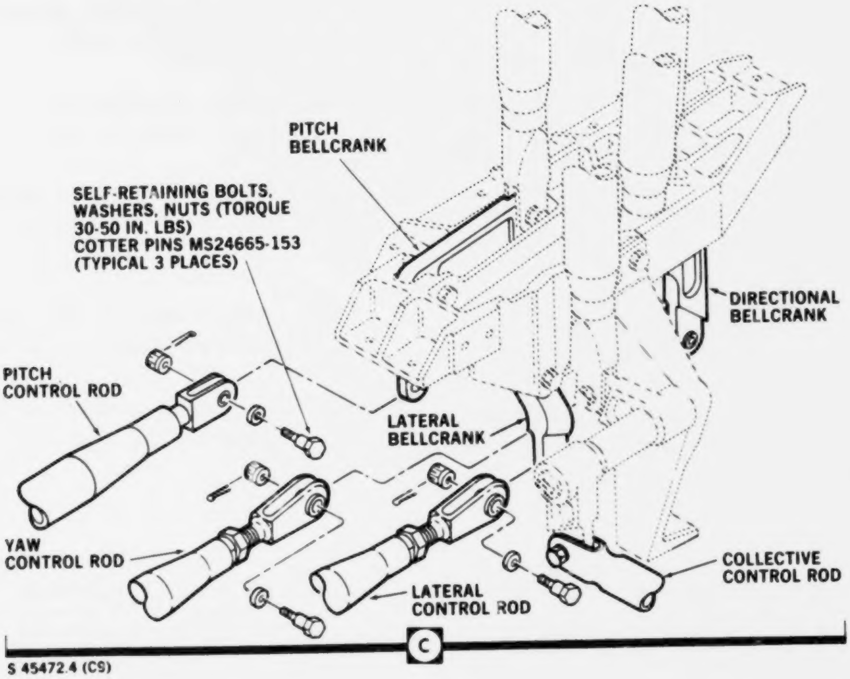

PITCH BELLCRANK
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153 (TYPICAL 3 PLACES)
DIRECTIONAL BELLCRANK
PITCH CONTROL ROD
LATERAL BELLCRANK
YAW CONTROL ROD
LATERAL CONTROL ROD
COLLECTIVE CONTROL ROD
C
S 45472.4 (CS)

FIGURE 11-107 (SHEET 3 OF 8)

ad. Install replacement lateral, or pitch control rod between bellcranks in lower support and bellcranks at cyclic stick. Install from cabin.

ae. Install self-retaining bolt and washers (under head) (PARA 11-1).

af. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ag. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ah. After replacing pilot's cockpit rods, do this:

(1) Install rigging pins in yaw pedal adjustors, and in pilot's cyclic stick, so controls are centered.

(2) Remove lateral rigging pin from cyclic sticks, and push pilot's stick 6.5 inches to right, measured at STICK TRIM switch.

(3) Remove remaining pin from cyclic stick, and move stick 2.75 inches toward front of helicopter, measured at STICK TRIM switch.

(4) Check lateral bellcrank clearance on right support. **CLEARANCE BETWEEN LATERAL BELLCRANK ARM AND YAW PUSHROD MUST BE 0.09 - 0.12 INCH.** Adjust lateral pushrod, as necessary, to get this clearance.

ai. Replace soundproofing on right side of cabin (PARA 2-32).

aj. Check area for cleanness and foreign material.

ak. Replace cockpit floor access panels (PARA 2-18).

al. Replace boots around cyclic stick (PARA 11-5).

REPLACE PILOT'S COLLECTIVE CONTROL RODS

am. Remove soundproofing panels on right side, to get to lower right support bellcranks (PARA 2-32).

an. Unbolt pilot's short control rod from collective stick and bellcrank (Detail D).

ao. Unbolt pilot's long control rod from bellcrank under collective stick and bellcrank in right support.

ap. Install replacement long control rod between bellcrank in right support and bellcrank under collective stick.

aq. Install self-retaining bolt and washers (under head) (PARA 11-1).

ar. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

as. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

at. Install replacement short control rod between collective stick and bellcrank.

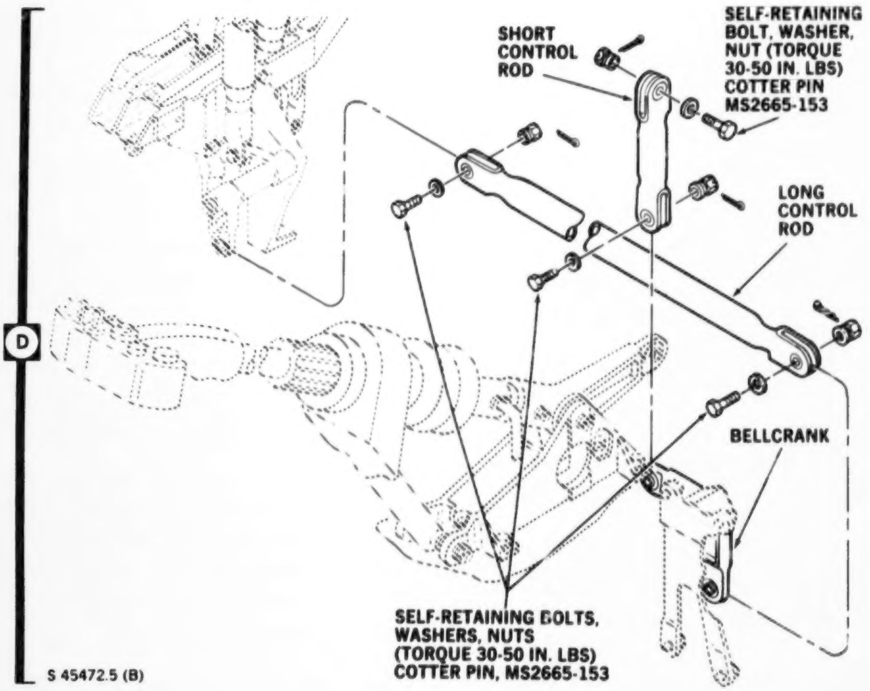
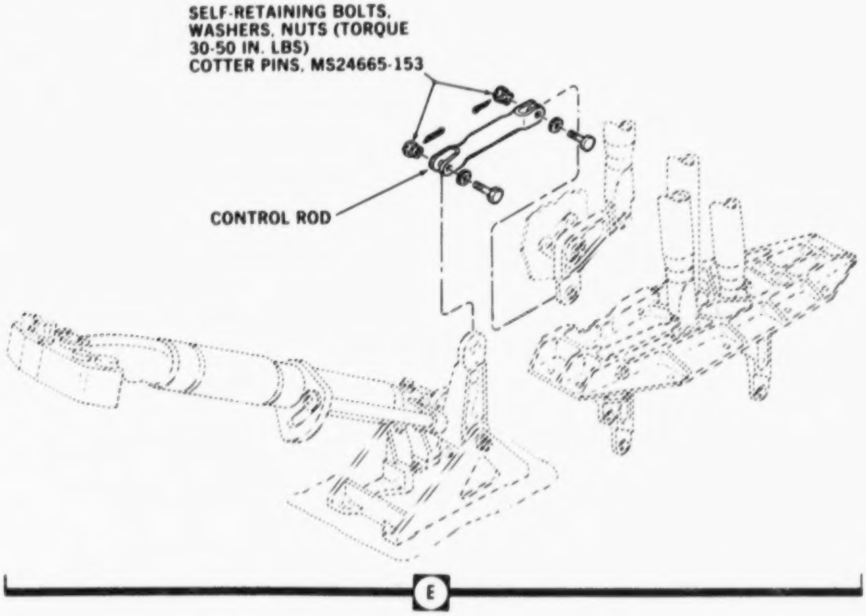

D
SHORT CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS2665-153
LONG CONTROL ROD
BELLCRANK
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PIN, MS2665-153
S 45472.5 (B)

FIGURE 11-107 (SHEET 4 OF 8)


SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS, MS24665-153
CONTROL ROD
E

S 45472.6 (B)

FIGURE 11-107 (SHEET 5 OF 8)

au. Install self-retaining bolt and washers (under head) (PARA 11-1).

av. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

aw. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ax. Check area for cleanness and foreign material.

ay. Replace soundproofing panels on right side (PARA 2-32).

REPLACE COPILOT'S COLLECTIVE CONTROL RODS

az. Remove soundproofing panels on left side, to get collective bellcrank.

ba. Unbolt short control rod from copilot's collective stick and bellcrank on bulkhead (Figure 11-107, Sheet 5, Detail E).

bb. Install replacement control rod between collective stick and bellcrank on bulkhead.

bc. Install self-retaining bolt and washers (under head) (PARA 11-1).

bd. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

be. PROOF **TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bf. Check area for cleanness and foreign material.

bg. Replace soundproofing panels (PARA 2-32).

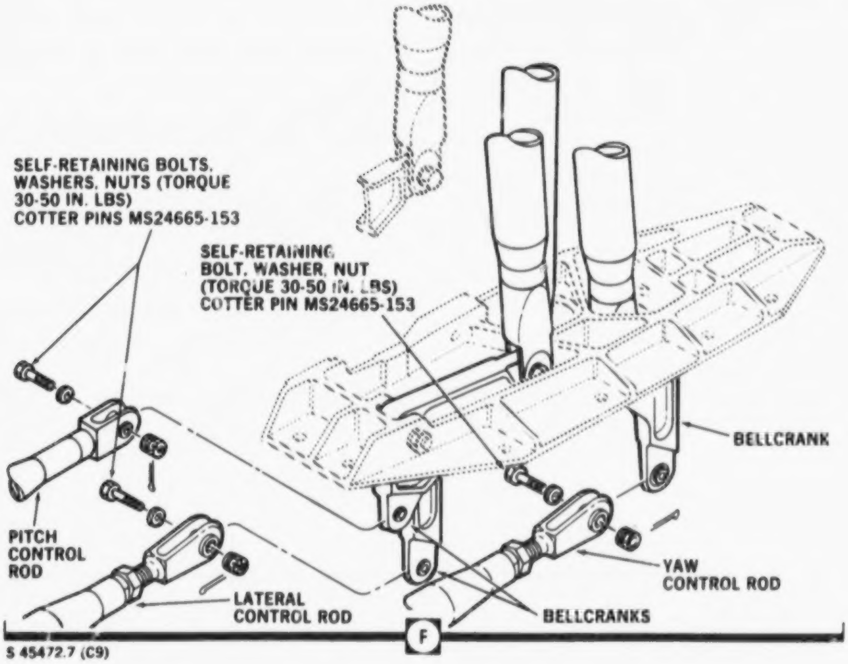

SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BELLCRANK
PITCH CONTROL ROD
YAW CONTROL ROD
LATERAL CONTROL ROD
BELLCRANKS
F
S 45472.7 (C9)

FIGURE 11-107 (SHEET 6 OF 8)

REPLACE COPILOT'S DIRECTIONAL AND CYCLIC CONTROL RODS

bh. Remove soundproofing panel on left side to get to lower left bellcrank support (PARA 2-32).

bi. Remove boots from around copilot's cyclic stick (PARA 11-5).

bj. Remove cockpit floor access panels (PARA 2-18).

bk. On helicopters serial No. 81-23571 and subsequent, remove access panel at station 214, waterline 208.

bl. Unbolt lateral, yaw, and pitch control rods from bellcranks in lower left support, and bellcranks at cyclic stick (Figure 11-107, Sheet 6, Detail F and Sheet 7, Detail G).

bm. Remove rods to rear, through cabin.

bn. Unbolt push-pull rod from cyclic stick yoke bellcrank and bellcrank on frame.

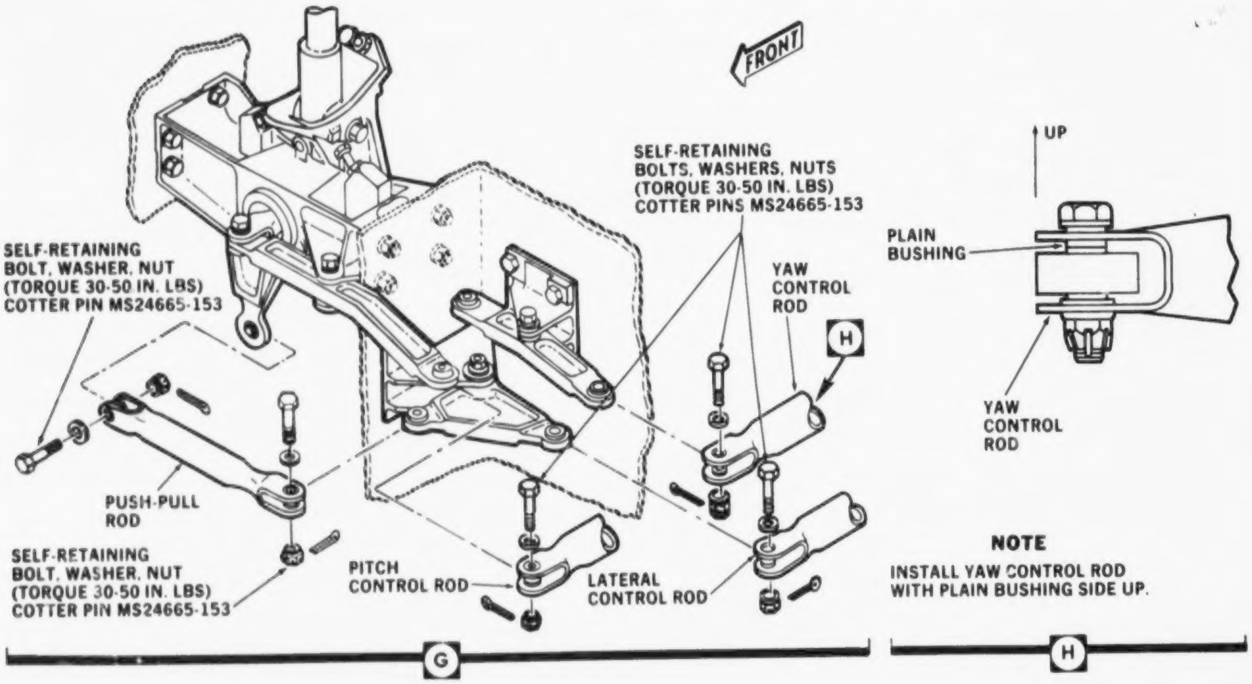
bo. Adjust replacement yaw control rod to 45.44 inches. **TIGHTEN JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

WARNING

Directional control movement will be limited if yaw control rod is improperly installed. Control rod bolt will chafe control rod trough.

bp. Install yaw control rod with plain-bushing side up.

11-27.2 CONTROL RODS - COCKPIT 11-27.2


FRONT
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
YAW CONTROL ROD
H
PUSH-PULL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
PITCH CONTROL ROD
LATERAL CONTROL ROD
G
UP
PLAIN BUSHING
YAW CONTROL ROD
H

NOTE

INSTALL YAW CONTROL ROD WITH PLAIN BUSHING SIDE UP.

S 45472.8 (BH2)

FIGURE 11-107 (SHEET 7 OF 8)

bq. Install replacement lateral, or pitch; control rod between bellcranks in lower support and bellcranks at cyclic stick. Install from cabin.

br. Install self-retaining bolt and washers (under head) (PARA 11-1).

bs. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

bt. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bu. Install replacement push-pull rod between cyclic stick yoke bellcrank and bellcrank on frame.

bv. Install self-retaining bolt and washers (under head) (PARA 11-1).

bw. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

bx. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

by. After replacing copilot's cyclic and directional control rods, do this:

  (1) Install rigging pins in yaw pedal adjustors, and in cyclic sticks, so controls are centered.

  (2) Remove lateral rigging pin from cyclic sticks, and push copilot's stick 3.5 inches to left, measured at STICK TRIM switch.

(3) Remove remaining rigging pin from cyclic stick, and move stick 2.75 inches, measured at STICK TRIM switch, toward front of helicopter.

(4) Check lateral bellcrank clearance on left support. **MAKE SURE THAT LATERAL BELLCRANK ARM CLEARS YAW PUSHROD BY 0.09 TO 0.12 INCH.** Adjust lateral control rod, as necessary, to get this clearance.

bz. Replace soundproofing panels (PARA 2-18).

ca. Check area for cleanness and foreign material.

cb. Replace floor panels, if no other rods are to be replaced (PARA 2-18).

cc. On helicopters serial Nos 81-23571 and subsequent, install panel at station 214, waterline 208, with screws and washers.

cd. Install boots on cyclic stick (PARA 11-5).

REPLACE COPILOT'S YAW PEDAL AND ADJUSTOR CONTROL RODS

ce. Remove boots from yaw pedals, and pedal adjustor (PARA 11-3).

cf. Remove toe pedals from support (PARA 11-3).

cg. Remove boots from cyclic stick (PARA 11-5).

ch. Remove floor panels (PARA 2-18).

ci. Unbolt and remove yaw pedal control rod from between adjustor lever and pedal supports (Figure 11-107, Sheet 8, Detail H).

NOTE

Helicopters prior to serial No. 77-22723 have nonadjustable control rods. **REPLACE RODS IF LENGTH BETWEEN HOLE CENTERS IS NOT 10.65 - 10.71 INCHES.**

cj. Remove lower left window when replacing copilot's directional control rod (PARA 2-15)

ck. Unbolt and remove directional control rod from between adjustor long lever and bellcrank through window frame.

cl. Install replacement directional control rod between adjustor long lever and bellcrank on frame.

cm. Install self-retaining bolt and washers (under head) (PARA 11-1).

cn. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

co. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

cp. Install replacement yaw pedal control rods between adjustor levers and pedal supports.

cq. Install self-retaining bolt and washers (under head) (PARA 11-1).

cr. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

11-27.2 CONTROL RODS - COCKPIT 11-27.2

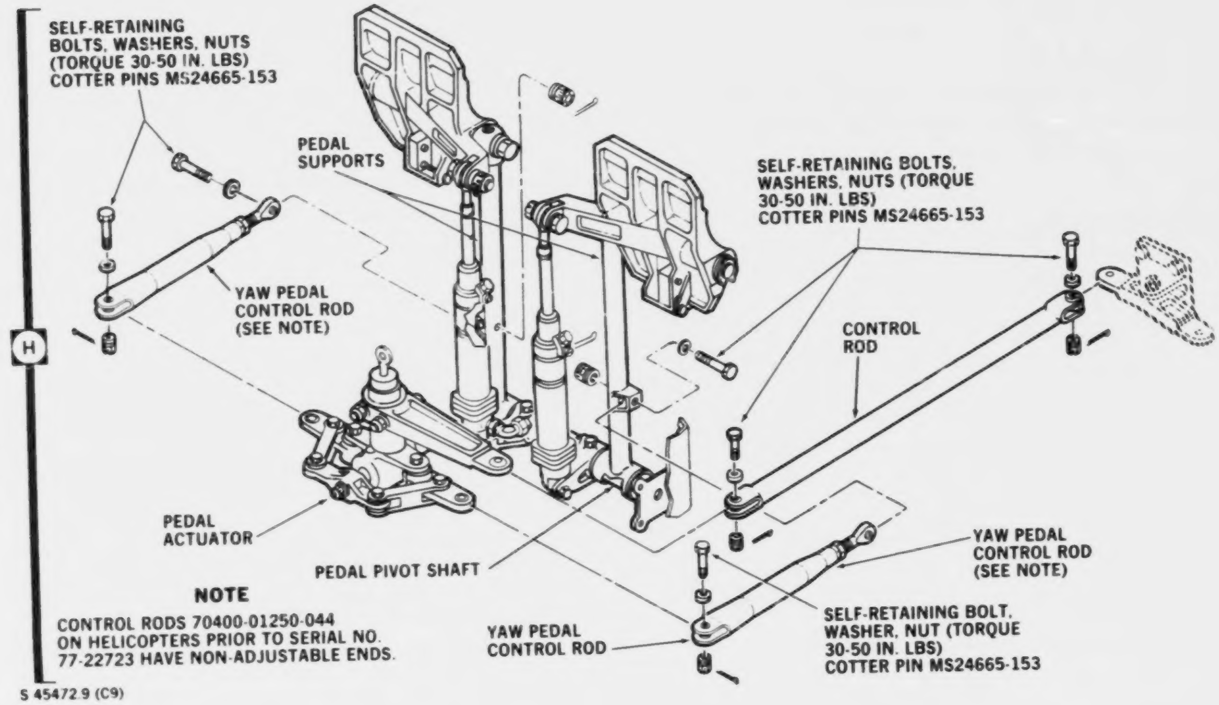

H
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
PEDAL SUPPORTS
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
YAW PEDAL CONTROL ROD (SEE NOTE)
CONTROL ROD
PEDAL ACTUATOR
PEDAL PIVOT SHAFT
YAW PEDAL CONTROL ROD (SEE NOTE)
NOTE
CONTROL RODS 70400-01250-044 ON HELICOPTERS PRIOR TO SERIAL NO. 77-22723 HAVE NON-ADJUSTABLE ENDS.
YAW PEDAL CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
S 45472.9 (C9)

FIGURE 11-107 (SHEET 8 OF 8)

cs. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ct. Check control rigging between cyclic sticks, pedal adjustors, and torque tubes, if rod ends were adjusted.

cu. Check area for cleanness and foreign material.

cv. Install floor panels (PARA 2-18).

cw. Install boots on cyclic stick (PARA 11-5).

cx. Install toe pedals on supports (PARA 11-13).

cy. Install pedal boots (PARA 11-3).

11-27.3 CONTROL RODS - INSIDE CABIN 11-27.3

REMOVE CONTROL RODS - RIGHT SIDE

NOTE

For application of hydraulic and electrical power to move flight controls, refer to PARA 11-27.1.

a. Remove soundproofing from cabin sides and ceiling between stations 247 and 267 (PARA 2-32).

b. Open main rotor pylon sliding cover with aid of an assistant.

c. Unbolt control rod from bellcranks at right lower support (Detail A).

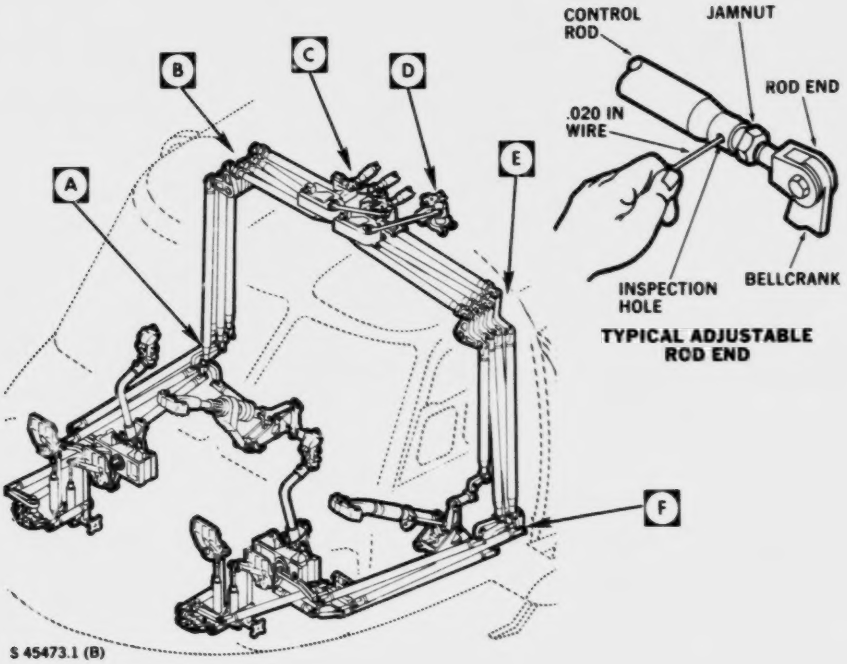
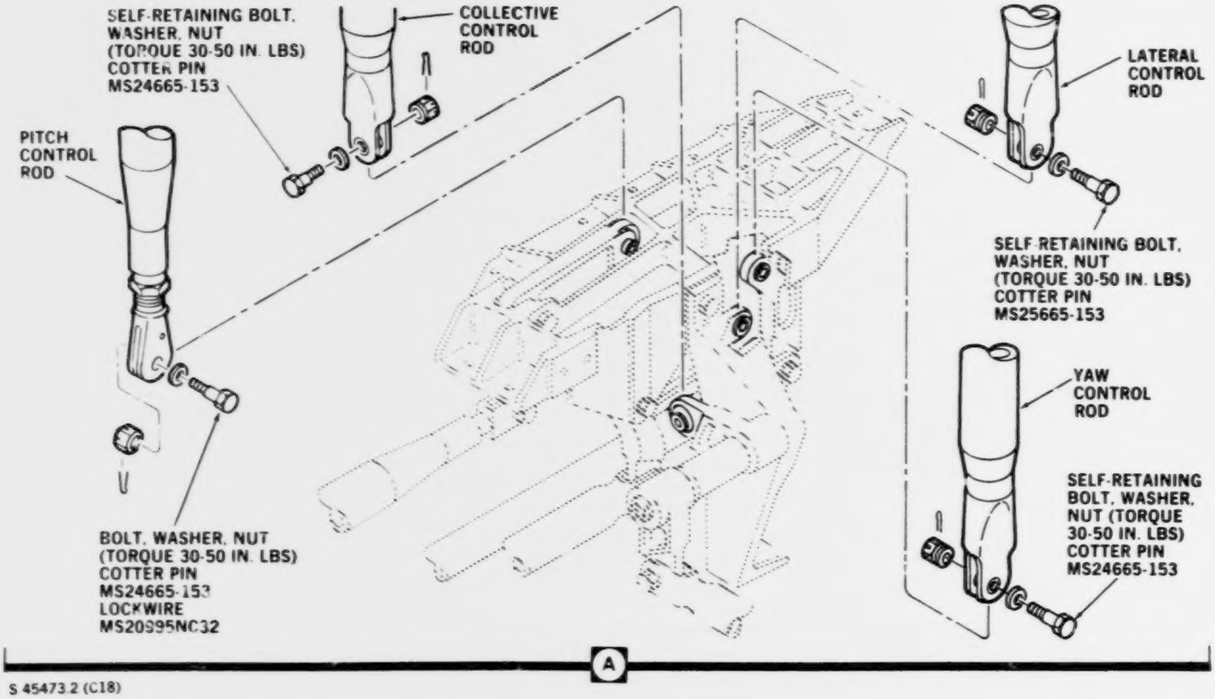

CONTROL ROD
JAMNUT
ROD END
.020 IN WIRE
INSPECTION HOLE
BELLCRANK
TYPICAL ADJUSTABLE ROD END
A
B
C
D
E
F
S 45473.1 (B)

FIGURE 11-108 (SHEET 1 OF 8)

11-27.3 CONTROL RODS - INSIDE CABIN 11-27.3


SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
COLLECTIVE CONTROL ROD
PITCH CONTROL ROD
LATERAL CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS25665-153
YAW CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153 LOCKWIRE MS20995NC32
A

S 45473.2 (C18)

FIGURE 11-108 (SHEET 2 OF 8)

d. Unbolt control rod at upper bellcranks (Detail B).

e. Measure removed adjustable rod from hole-center to hole-center.

REMOVE CONTROL RODS OVERHEAD

f. Release tension from cyclic and collective balance springs (PARA 11-2).

g. Unbolt control rod at torque shafts (Details C and D).

h. Measure removed adjustable rod from hole-center to hole-center.

REMOVE CONTROL RODS LEFT SIDE

i. Unbolt control rod from upper bellcranks (Detail E).

j. Unbolt control rod from bellcranks at left lower support (Detail F).

k. Measure removed adjustable control rod hole-center to hole-center.

11-27.3 CONTROL RODS - INSIDE CABIN 11-27.3

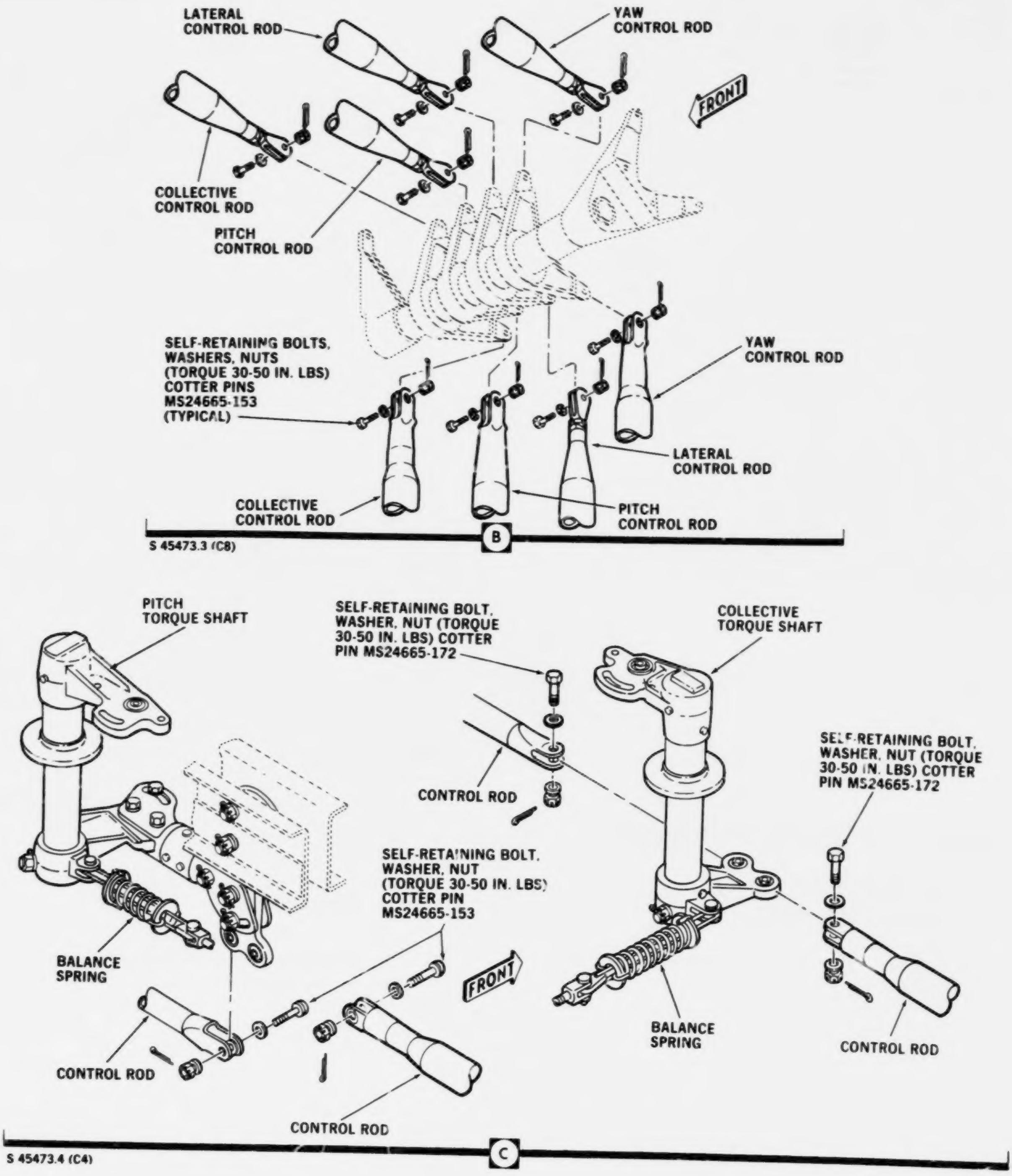

LATERAL CONTROL ROD
YAW CONTROL ROD
FRONT
COLLECTIVE CONTROL ROD
PITCH CONTROL ROD
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153 (TYPICAL)
YAW CONTROL ROD
LATERAL CONTROL ROD
COLLECTIVE CONTROL ROD
PITCH CONTROL ROD
B
S 45473.3 (C8)
PITCH TORQUE SHAFT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-172
COLLECTIVE TORQUE SHAFT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-172
CONTROL ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BALANCE SPRING
FRONT
BALANCE SPRING
CONTROL ROD
CONTROL ROD
CONTROL ROD
C
S 45473.4 (C4)

FIGURE 11-108 (SHEET 3 OF 8)

11-27.3 CONTROL RODS - INSIDE CABIN 11-27.3

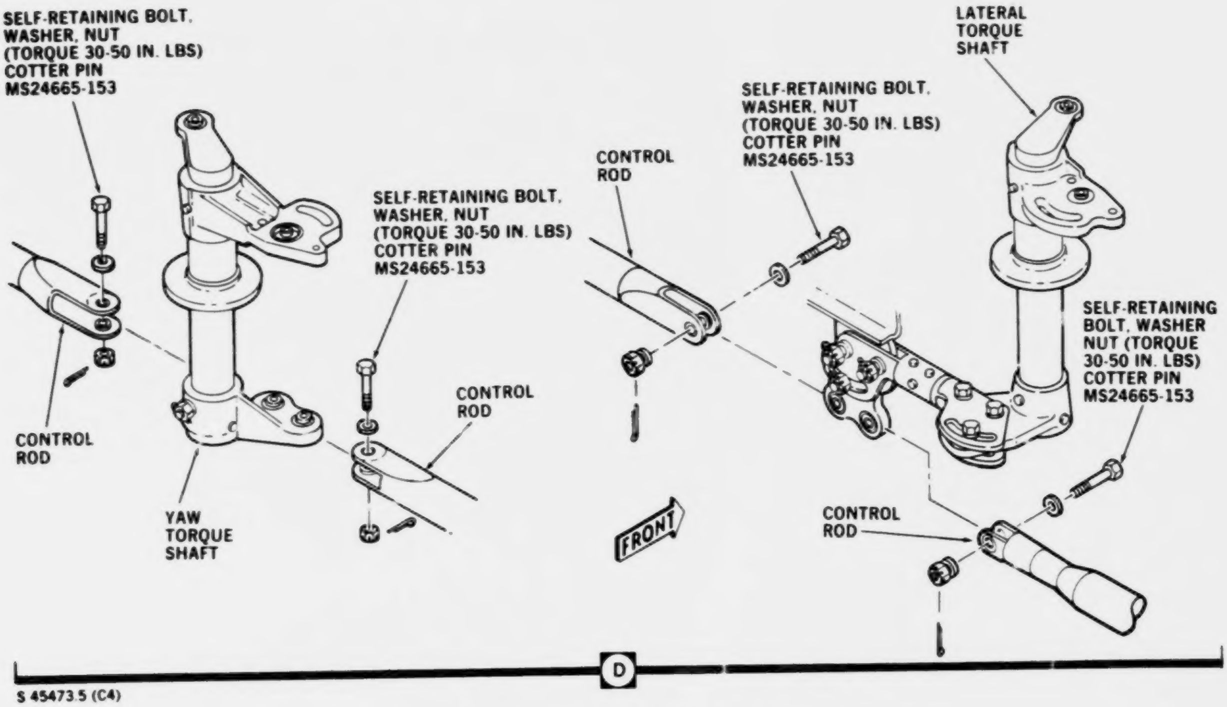

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
YAW TORQUE SHAFT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
CONTROL ROD
FRONT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
LATERAL TORQUE SHAFT
SELF-RETAINING BOLT, WASHER NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
D
S 45473.5 (C4)

FIGURE 11-108 (SHEET 4 OF 8)

INSTALL CONTROL RODS

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

CAUTION

To prevent binding of lateral clevis on lower bellcrank during operation, install lateral control tube with adjustable clevis end on top.

l. Move cyclic or directional controls in cockpit to line up rigging pin holes in control system.

m. Insert rigging pin at rigging pin hole nearest each end of control rod to be installed (PARA 11-27.1).

n. Measure adjustable control rod dimensions from hole-center to hole-center. Loosen jamnut and adjust threaded rod end to dimensions of removed rod, if necessary.

NOTE

If removed control rod is not available for measurement, replacement rod may be installed between bellcranks, and threaded rod end adjusted in place on airframe.

11-27.3 CONTROL RODS - INSIDE CABIN

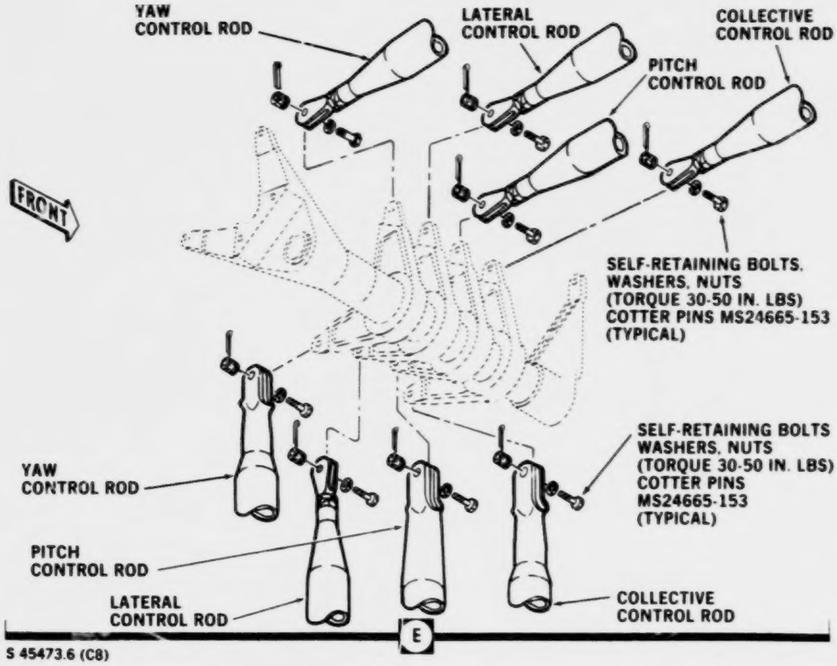

YAW
CONTROL ROD
LATERAL
CONTROL ROD
COLLECTIVE
CONTROL ROD
PITCH
CONTROL ROD
FRONT
SELF-RETAINING BOLTS.
WASHERS, NUTS
(TORQUE 30-50 IN. LBS)
COTTER PINS MS24665-153
(TYPICAL)
SELF-RETAINING BOLTS
WASHERS, NUTS
(TORQUE 30-50 IN. LBS)
COTTER PINS
MS24665-153
(TYPICAL)
YAW
CONTROL ROD
PITCH
CONTROL ROD
LATERAL
CONTROL ROD
COLLECTIVE
CONTROL ROD
E
S 45473.6 (C8)

FIGURE 11-108 (SHEET 5 OF 8)

o. Adjust threaded rod end in place, if necessary.

p. Insert 0.020-inch wire into inspection hole in adjustable control rod. Adjusted threaded rod end must prevent wire from passing through inspection hole.

q. Lock rod end in place with jamnut. **TIGHTEN JAMNUT 1/6 to 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.** Install control rod in place.

r. Install self-retaining bolt and washers (under head) (PARA 11-1).

s. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

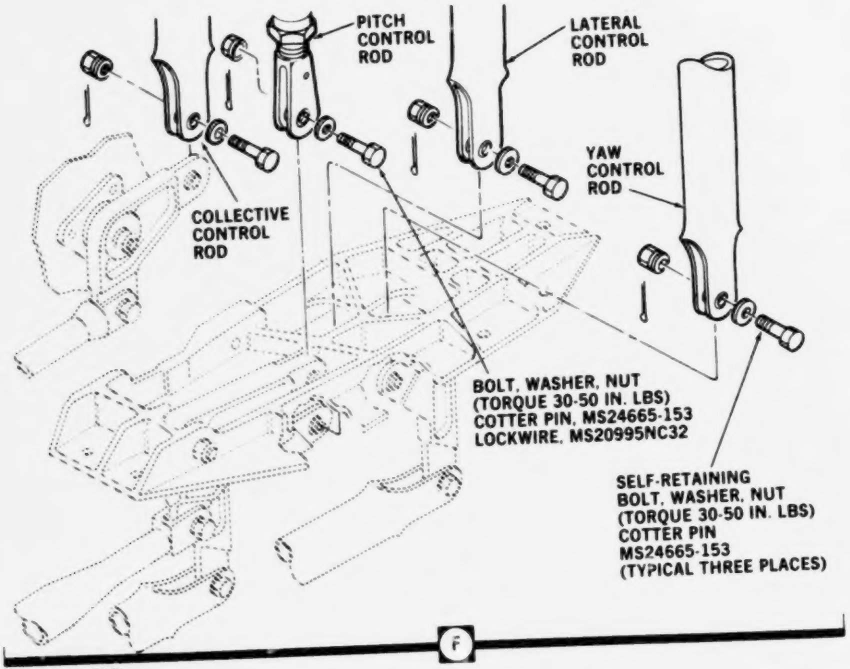
t. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

u. Remove rigging pins.

NOTE

If a rigging pin binds during removal, you may have to adjust one of the adjustable control rods. Do the above procedures again.

v. Move collective control in cockpit to line up rigging pin hole in control system.


PITCH CONTROL ROD
LATERAL CONTROL ROD
YAW CONTROL ROD
COLLECTIVE CONTROL ROD
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-153 LOCKWIRE, MS20995NC32
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153 (TYPICAL THREE PLACES)
F

S 45473.7 (C18)

FIGURE 11-108 (SHEET 6 OF 8)

w. Insert rigging pin at rigging pin hole in collective control system (PARA 11-27.1).

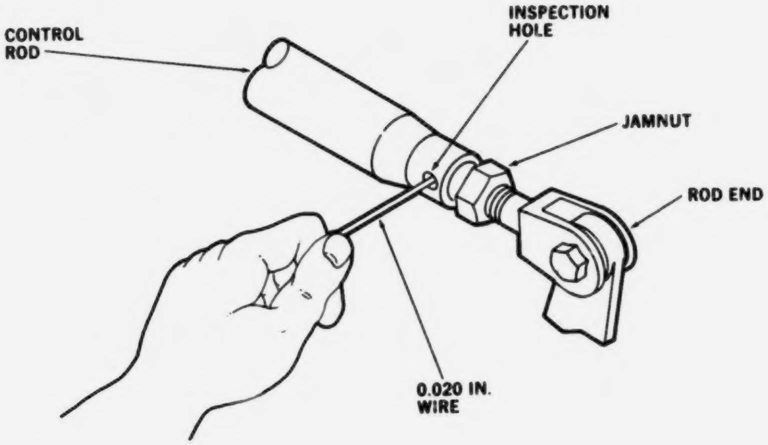
x. Measure adjustable control rod dimensions from hole-center to hole-center. Loosen jamnut and adjust threaded rod end to dimensions of removed rod, if necessary. If removed control rod is not available for measurement, replacement rod be installed between bellcranks, and threaded rod end adjusted in place on airframe. This adjustment requires that low pitch stop gage dimension at collective stick be held, as shown in following step.

(1) Place a 0.010- to 0.030-inch feeler gage in low pitch stop of applicable collective stick. Have assistant hold down collective stick to hold gage dimension, and adjust threaded rod end in place.

(2) Insert 0.020-inch wire into inspection hole in adjustable control rod. Adjusted threaded rod end must prevent wire from passing through inspection hole.

(3) Lock rod end in place with jamnut. **TIGHTEN JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.** Install control rod in place.

y. Install self-retaining bolt and washers (under head).



TYPICAL ADJUSTABLE ROD END

S 45473.8 (B)

FIGURE 11-108 (SHEET 7 OF 8)

z. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153 (PARA 11-1).

aa. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

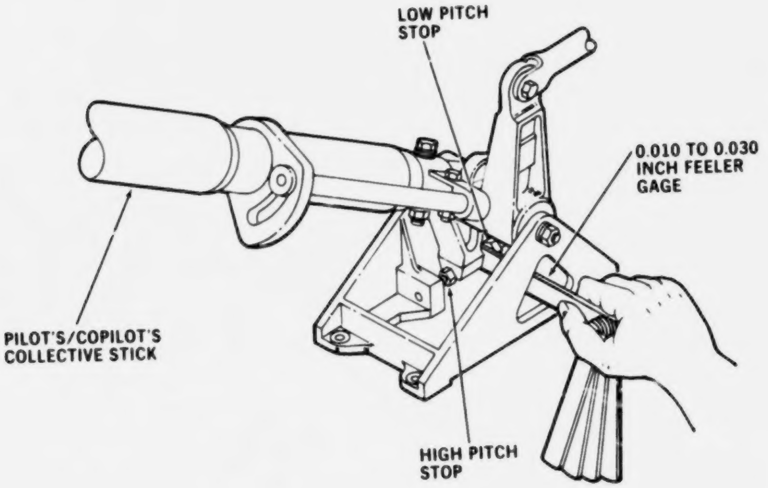
(1) Remove rigging pin. Then have assistant relax collective stick and remove gage from low pitch stop.

NOTE

If rigging pin binds during removal, you may have to adjust one of the adjustable control rods. Do the above procedures again.

(2) On lower end of vertical pitch control rod (Figure 11-108, Sheet 2, Detail A and Sheet 6, Detail F) install bolt, washer, and nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153, lockwire, Item 199, Appendix D, bolthead to clevis.

11-27.3 CONTROL RODS - INSIDE CABIN


LOW PITCH STOP
0.010 TO 0.030 INCH FEELER GAGE
PILOT'S/COPILOT'S COLLECTIVE STICK
HIGH PITCH STOP

ADJUSTING COLLECTIVE STICK STOPS

S 45473 9 (B)

FIGURE 11-108 (SHEET 8 OF 8)

ab. Adjust cyclic and collective balance springs (PARA 11-2).

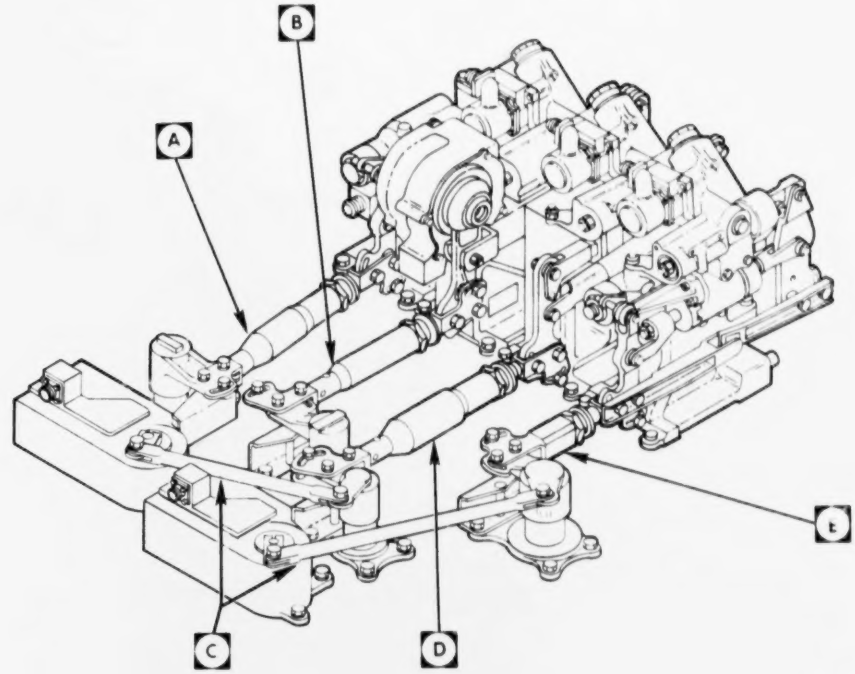
ac. Turn off backup hydraulic system. Remove external electrical power (PARA 1-6.3).

ad. Check area for cleanness and foreign material.

ae. Install soundproofing panels (PARA 2-32).

af. Close main rotor pylon sliding cover.

11-27.4 CONTROL RODS - TORQUE SHAFT TO SERVOS 11-27.4



S 45474.1 (BH4)

FIGURE 11-109 (SHEET 1 OF 7)

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

NOTE

For application of hydraulic and electrical power to move flight controls refer to PARA 11-27.1.

REPLACE COLLECTIVE INPUT CONTROL ROD

a. Open and remove main rotor pylon sliding cover (PARA 2-43).

b. Move collective stick fully down.

c. Install rigging pin in collective torque shaft.

11-27.4 CONTROL RODS - TORQUE SHAFT TO SERVOS 11-27.4

d. Install long rigging pin in right side of mixer.

e. Unbolt collective input control rod from between torque shaft and collective servo arm (Figure 11-109, Sheet 2, Detail A).

f. Adjust replacement control rod to exact length, hole-center to hole-center, as removed control rod, as follows:

(1) Slide locking device away from sleeve.

(2) Thread sleeve out of tube assembly to make control rod longer.

(3) Thread sleeve into tube assembly to make control rod shorter.

(4) **TIGHTEN SLEEVE JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT** (Sheet 2.1).

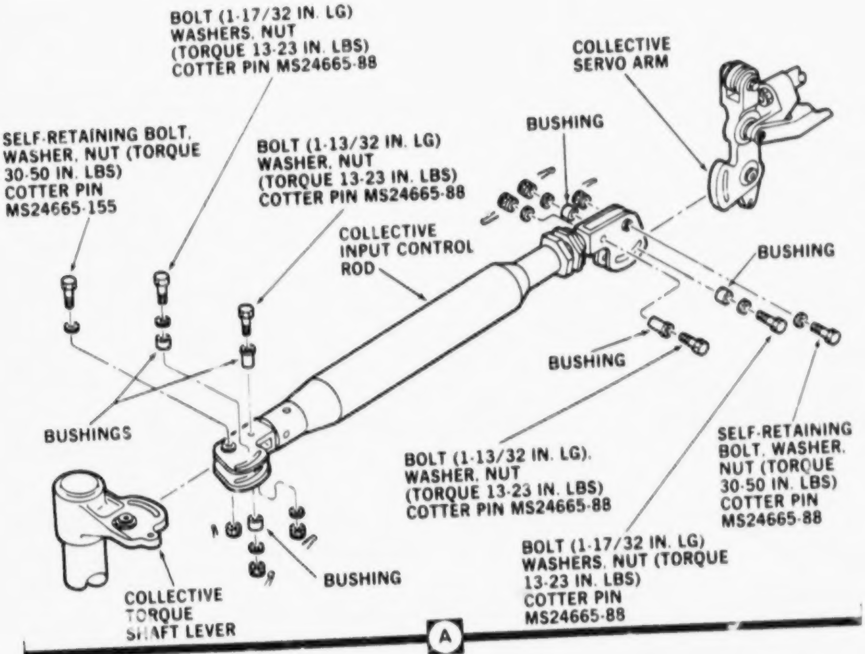
(5) Engage keys of locking device-1 with keyway in sleeve. Slide locking device-2 against locking device-1 to engage notches.

(6) **TORQUE ROD END JAMNUT TO 213 - 237 INCH-POUNDS.**

(7) Insert a 0.020-inch wire into inspection hole in tube assembly. Adjusted sleeve must stop wire from passing through.

(8) Check that plastic spot in rod end keyway cannot be seen outside rod end jamnut.

(9) Do not lockwire now.


BOLT (1-17/32 IN. LG)
WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-88
COLLECTIVE
SERVO ARM
SELF-RETAINING BOLT,
WASHER, NUT (TORQUE
30-50 IN. LBS)
COTTER PIN
MS24665-155
BOLT (1-13/32 IN. LG)
WASHER, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-88
BUSHING
COLLECTIVE
INPUT CONTROL
ROD
BUSHING
BUSHING
BUSHINGS
SELF-RETAINING
BOLT, WASHER,
NUT (TORQUE
30-50 IN. LBS)
COTTER PIN
MS24665-88
BOLT (1-13/32 IN. LG),
WASHER, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-88
BOLT (1-17/32 IN. LG)
WASHERS, NUT (TORQUE
13-23 IN. LBS)
COTTER PIN
MS24665-88
BUSHING
COLLECTIVE
TORQUE
SHAFT LEVER
A

S 45474.2 (C8)

FIGURE 11-109 (SHEET 2 OF 7)

g. Install control rod between torque shaft lever and servo arm, with adjustable end at servo arm (Figure 11-109, Sheet 2, Detail A).

h. Install self-retaining bolt and washers (under head) (PARA 11-1).

i. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

j. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

k. Check that rigging pins slide in and out of their holes freely. Adjust control rod until this can be done.

l When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to tab of locking device.

m. Install bushings, bolts, washers, and nuts (Detail B). **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

n. Remove rigging pins from torque shaft and mixer

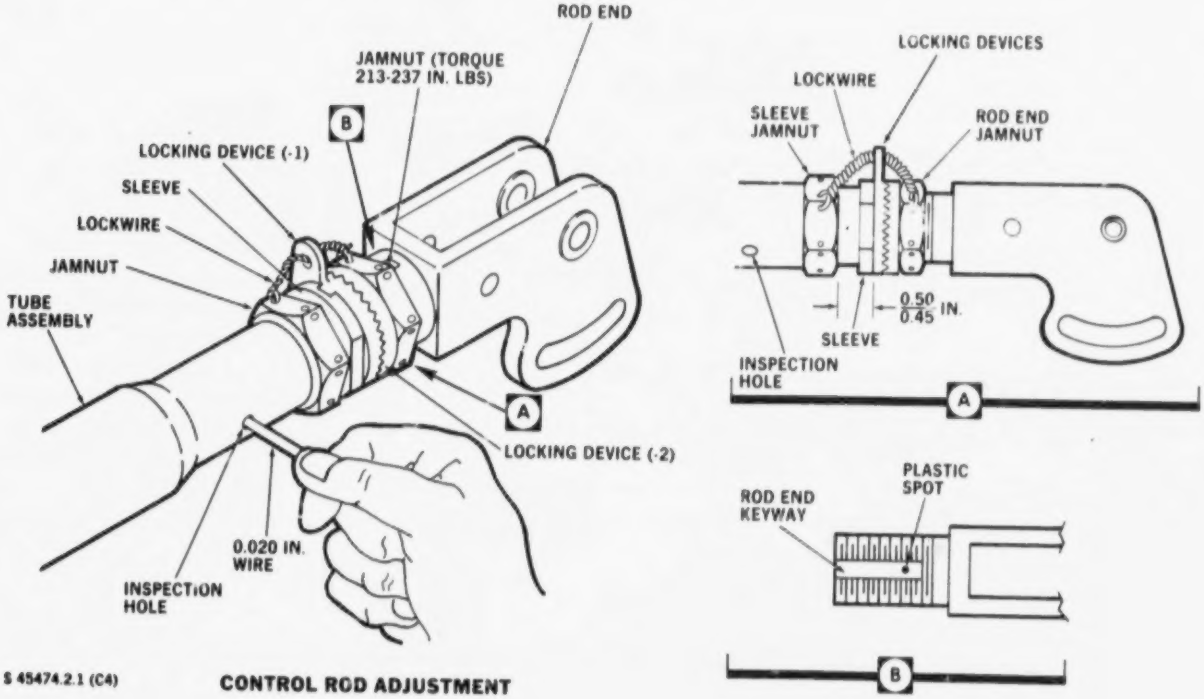
o. Check area for clearness and foreigh material

p. Inspect installed control rod for proper tri pivot bolt installation (PARA 11-1).

q. Install main rotor pylon sliding cover (PARA 2-43)

REPLACE PITCH/TRIM INPUT CONTROL ROD

r. Center cyclic stick.


ROD END
JAMNUT (TORQUE 213-237 IN. LBS)
B
LOCKING DEVICE (-1)
SLEEVE
LOCKWIRE
JAMNUT
TUBE ASSEMBLY
A
LOCKING DEVICE (-2)
0.020 IN. WIRE
INSPECTION HOLE
LOCKING DEVICES
LOCKWIRE
SLEEVE JAMNUT
ROD END JAMNUT
0.50
0.45 IN.
SLEEVE
INSPECTION HOLE
A
PLASTIC SPOT
ROD END KEYWAY
B

S 45474.2.1 (C4)

CONTROL ROD ADJUSTMENT

FIGURE 11-109 (SHEET 3 OF 7)

11-27.4 CONTROL RODS - TORQUE SHAFT TO SERVOS 11-27.4

s. Install rigging pin in pitch torque shaft lever.

t. Install rigging pin in pitch trim assembly.

u. Unbolt pitch/trim input control rod from between torque shaft and pitch/trim servo arm (Detail B)

v. Adjust replacement control rod to exact length, hole-center to hole-center as removed control rod in same way as collective input control rod

w. Install control rod between torque shaft lever and servo arm with adjustable end at servo (Figure 11-109, Sheet 4, Detail B).

NOTE

Boltheads can face either direction when installing bolts in pitch input control rod and pitch trim servo lever.

x. Install self-retaining bolt and washers (under head) (PARA 11-1).

y. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

z. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aa. Check that rigging pins slide in and out of their holes freely. Adjust control rod until this can be done.

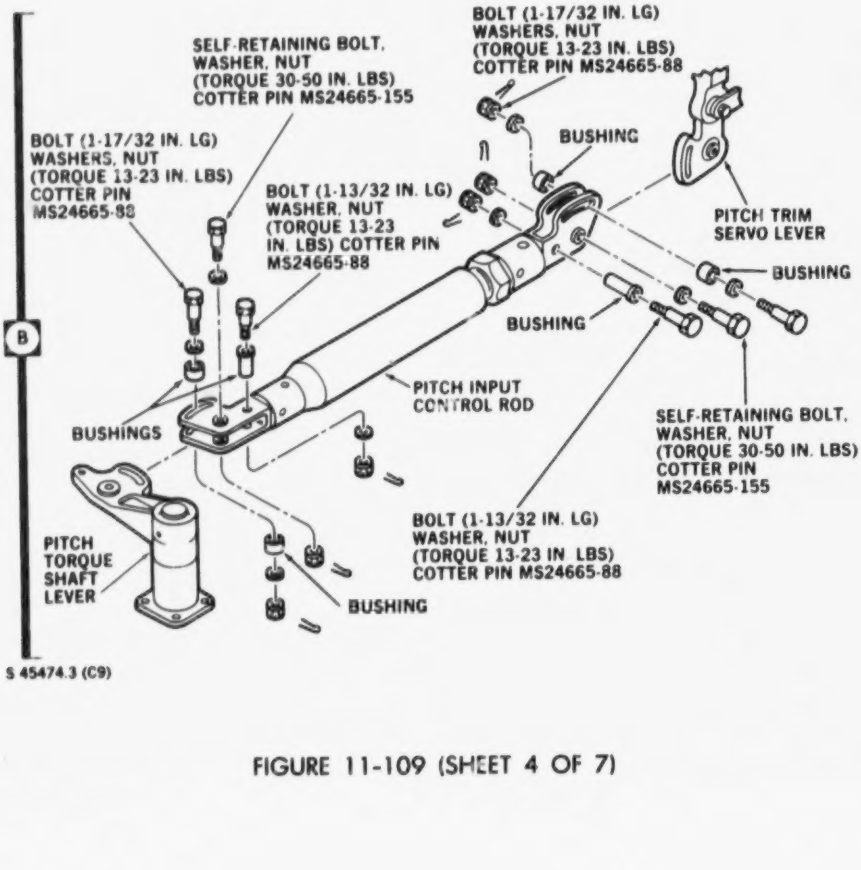

BOLT (1-17/32 IN. LG)
WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-88
SELF-RETAINING BOLT,
WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN MS24665-155
BUSHING
BOLT (1-17/32 IN. LG)
WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-88
BOLT (1-13/32 IN. LG)
WASHER, NUT
(TORQUE 13-23
IN. LBS) COTTER PIN
MS24665-88
PITCH TRIM
SERVO LEVER
BUSHING
BUSHING
B
PITCH INPUT
CONTROL ROD
BUSHINGS
SELF-RETAINING BOLT,
WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-155
BOLT (1-13/32 IN. LG)
WASHER, NUT
(TORQUE 13-23 IN LBS)
COTTER PIN MS24665-88
PITCH
TORQUE
SHAFT
LEVER
BUSHING
S 45474.3 (C9)

FIGURE 11-109 (SHEET 4 OF 7)

11-27.4 CONTROL RODS - TORQUE SHAFT TO SERVOS 11-27.4

ab. When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to tab of locking device.

ac. Install bushings, bolts, washers, and nuts (Figure 11-109, Sheet 4, Detail B). **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pins, MS24665-88.

ad. Check area for cleanness and foreign material.

ae. Inspect installed control rod for proper tripivot bolt installation (PARA 11-1).

af. Install main rotor pylon sliding cover (PARA 2-43).

REPLACE ROLL TRIM/YAW TRIM SERVO ROD

ag. Unbolt and remove control rod from roll trim servo and lateral torque shaft (Figure 11-109, Sheet 5, Detail C).

ah. Unbolt and remove control rod from yaw torque shaft (Figure 11-109, Sheet 5, Detail C).

ai. Remove socket head screw, and slide lever from shaft on yaw trim servo.

aj. Unbolt and remove control rod from lever.

ak. Install yaw trim servo lever on control rod.

al. Install self-retaining bolt and washers (under head) (PARA 11-1).

am. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

an. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ao. Slide lever on yaw trim servo shaft. Secure with socket head screw using socket wrench attachment. **TORQUE SCREW TO 22 - 25 INCH-POUNDS.**

ap. Install control rod on yaw torque shaft lever.

aq. Install self-retaining bolt and washers (under head).

ar. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

as. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

at. Install replacement control rod between roll trim servo lever and lateral torque shaft lever.

au. Install self-retaining bolt and washers (under head) (PARA 11-1).

av. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

aw. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

REPLACE LATERAL INPUT CONTROL ROD

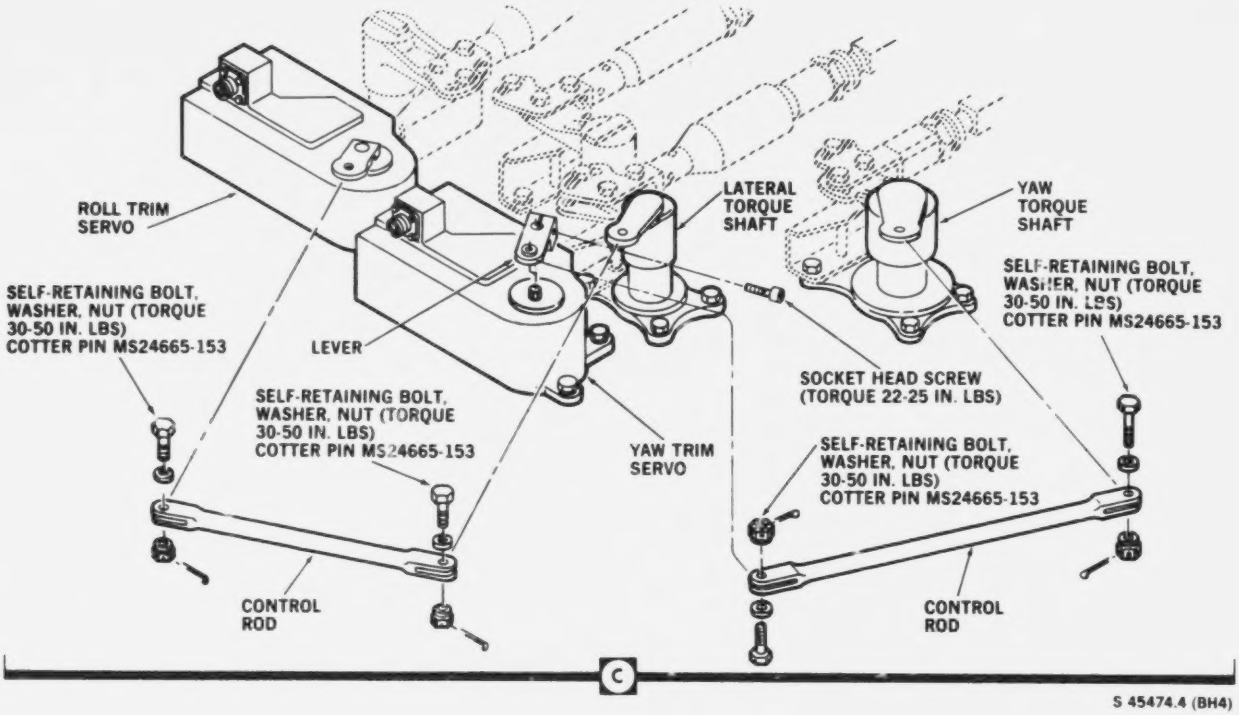
ax. Remove main rotor pylon sliding cover.

ay. Center cyclic stick.

az. Install rigging pin in lateral torque shaft lever.

ba. Install rigging pin in roll actuator lever.

11-27.4 CONTROL RODS - TORQUE SHAFT TO SERVOS 11-27.4


ROLL TRIM SERVO
LATERAL TORQUE SHAFT
YAW TORQUE SHAFT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
LEVER
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SOCKET HEAD SCREW (TORQUE 22-25 IN. LBS)
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
YAW TRIM SERVO
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
CONTROL ROD
CONTROL ROD
C

S 45474.4 (BH4)

FIGURE 11-109 (SHEET 5 OF 7)

bb. Unbolt input control rod from between torque shaft and roll actuator lever (Detail D).

bc. Adjust replacement control rod to exact length, hole-center to hole-center, as removed control rod, in same way as collective input control rod.

bd. Install control rod between torque shaft lever and actuator lever with adjustable end at actuator lever (Detail D).

be. Install self-retaining bolt and washers (under head) (PARA 11-1).

bf. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

bg. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bh. Check that rigging pins slide in and out of their holes freely. Adjust control rod until this can be done.

bi. When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to tab of locking device.

bj. Install bushings, bolts, washers, and nuts in rod ends. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pins, MS24665-88.

bk. Remove rigging pins from torque shaft and roll actuator.

bl. Check area for cleanness and foreign material.

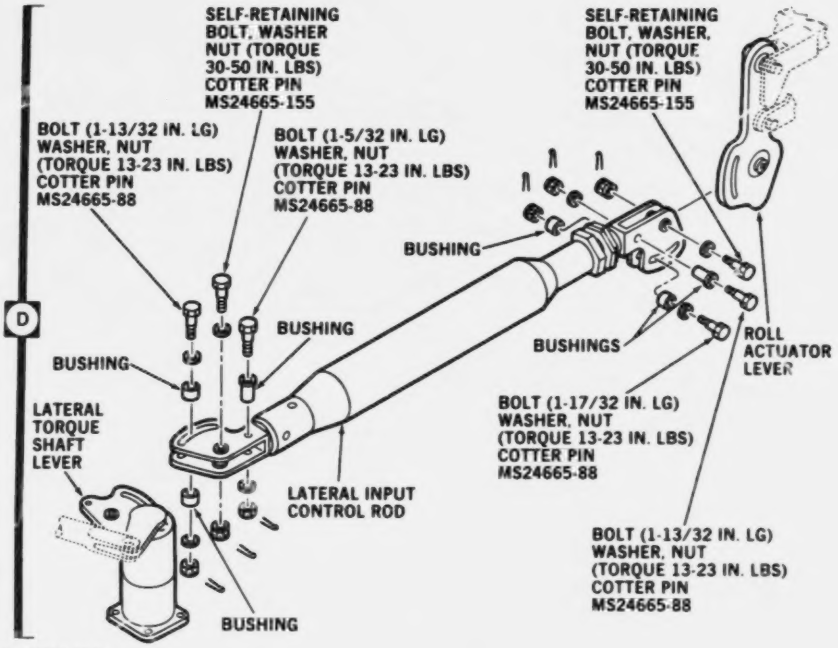

SELF-RETAINING BOLT, WASHER NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-13/32 IN. LG) WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BOLT (1-5/32 IN. LG) WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BUSHING
D
BUSHING
BUSHING
BUSHINGS
ROLL ACTUATOR LEVER
LATERAL TORQUE SHAFT LEVER
BOLT (1-17/32 IN. LG) WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
LATERAL INPUT CONTROL ROD
BOLT (1-13/32 IN. LG) WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BUSHING
S 45474.5 (C5)

FIGURE 11-109 (SHEET 6 OF 7)

bm. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

bn. Install main rotor pylon sliding cover.

REPLACE YAW SERVO INPUT CONTROL ROD

bo. Remove main rotor pylon sliding cover.

bp. Center yaw pedals.

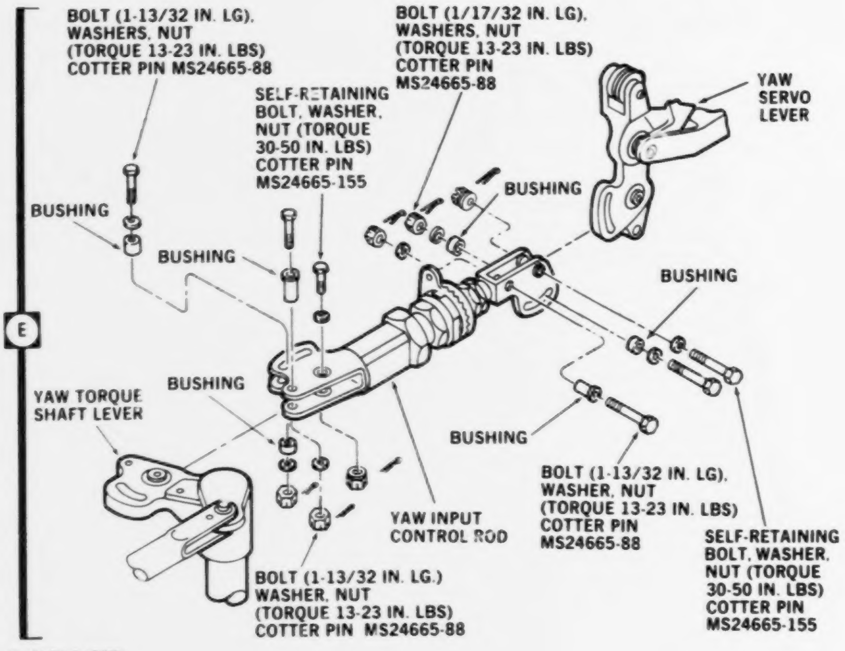
bq. Insert rigging pin in yaw torque shaft lever.

br. Insert rigging tool in yaw boost servo lever.

bs. Unbolt yaw input control rod from between torque shaft and yaw servo lever.

bt. Adjust replacement control rod to exact length, hole-center to hole-center, as removed control rod in same way as collective input control rod.

11-27.4 CONTROL RODS - TORQUE SHAFT TO SERVOS 11-27.4


BOLT (1-13/32 IN. LG),
WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-88
BOLT (1/17/32 IN. LG),
WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-88
SELF-RETAINING
BOLT, WASHER,
NUT (TORQUE
30-50 IN. LBS)
COTTER PIN
MS24665-155
YAW
SERVO
LEVER
BUSHING
BUSHING
BUSHING
BUSHING
E
BUSHING
YAW TORQUE
SHAFT LEVER
BUSHING
BOLT (1-13/32 IN. LG),
WASHER, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-88
YAW INPUT
CONTROL ROD
SELF-RETAINING
BOLT, WASHER,
NUT (TORQUE
30-50 IN. LBS)
COTTER PIN
MS24665-155
BOLT (1-13/32 IN. LG.)
WASHER, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-88

S 45474.7 (C22)

FIGURE 11-109 (SHEET 7 OF 7)

bu. Install control rod between torque shaft lever and servo lever with adjustable end at servo (Figure 11-109, Sheet 7, Detail E).

bv. Install self-retaining bolt and washers (under head) (PARA 11-1).

bw. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

bx. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

by. Check that rigging pin and rigging tool slide in and out of their holes freely. Adjust control rod until this can be done.

bz. When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to tab of locking device.

ca. Install bushings, bolts, washers, and nuts (Figure 11-109, Sheet 7, Detail E). **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pins, MS24665-88.

cb. Remove rigging pin from torque shaft and tool from yaw servo.

cc. Check area for cleanness and foreign material.

cd. Inspect installed control rod for proper tripivot bolt installation (PARA 11-1).

ce. Install main rotor pylon sliding cover (PARA 2-43).

CONTROL RODS - SERVOS TO MIXER

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

NOTE

For application of hydraulic and electrical power to move flight electrical power to move flight controls, refer to PARA 11-27.1.

COLLECTIVE SERVO

a. Open main rotor pylon sliding covers.

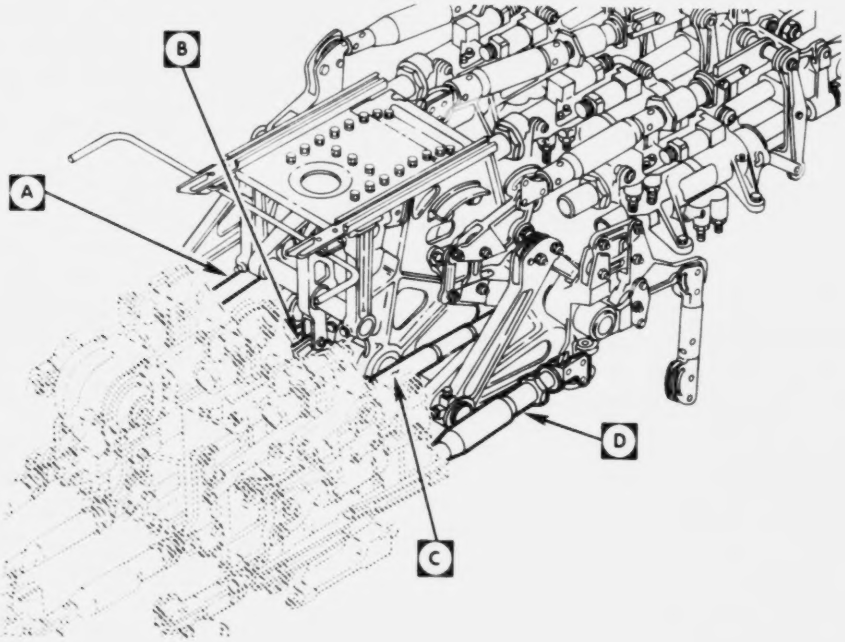
b. Remove bolt, washer, bushing, and nut from mixer arm (Detail A).

c. Unbolt collective control rod from mixer arm.

d. Unbolt control rod from collective servo arm.

INSPECT

e. Inspect, replace or repair control rod (PARA 11-23).



S 45596 1 (C4)

FIGURE 11-110 (SHEET 1 OF 8)

11-27.5 CONTROL RODS - SERVOS TO MIXER 11-27.5

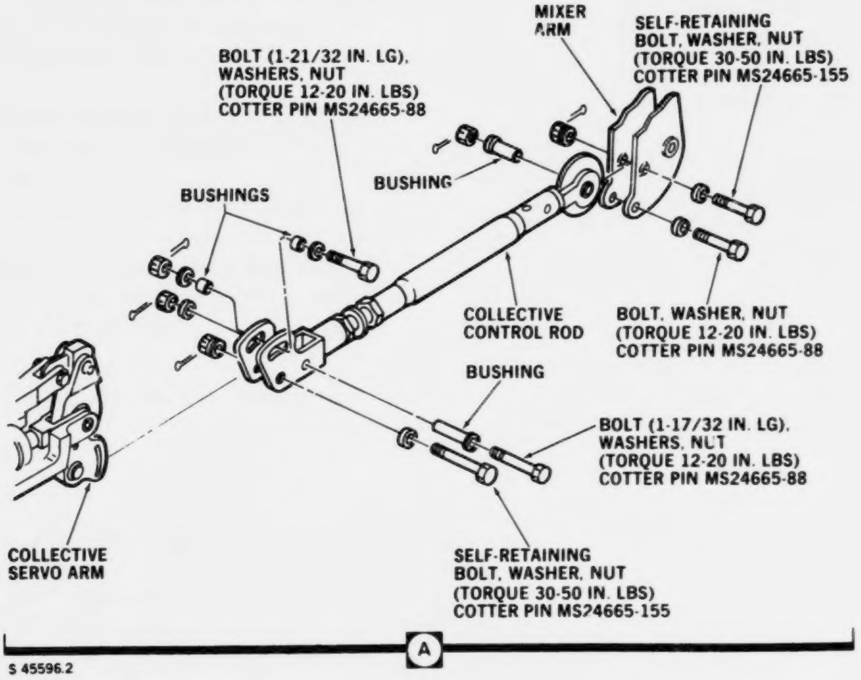

MIXER ARM
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-21/32 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
BUSHING
BUSHINGS
COLLECTIVE CONTROL ROD
BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
BUSHING
BOLT (1-17/32 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
COLLECTIVE SERVO ARM
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
A
S 45596.2

FIGURE 11-110 (SHEET 2 OF 8)

INSTALL

f. Adjust replacement control rod to exact length, hole-center to hole-center, as on removed rod as follows (Figure 11-10, Sheet 3):

(1) Loosen jamnuts.

(2) Turn adjustor to lengthen or shorten control rod.

(3) Insert 0.020-inch wire into inspection holes in tube and rod end.

(4) Adjustor threads should stop wire from passing through inspection holes.

(5) **TIGHTEN TUBE ASSEMBLY JAMNUT 1/6 - 1/3 TURN PAST WHERE SHARP RISE IN TORQUE IS FELT.**

(6) **TORQUE ROD END JAMNUT TO 213 - 237 INCH-POUNDS.**

(7) Do not lockwire now.

g. Install control rod between mixer arm and servo arm, with adjustable end at servo arm.

NOTE

Boltheads can face either direction when installing bolts in servo arm, mixer arm, and control rod.

h. Temporarily install self-retaining bolts at each end.

i. If replacement control rod has not been trammeled to exact length of replaced control rod or length of replaced control rod is not known, position collective servo at low collective (full rear).

j. Install a 5/16- by 36-inch rigging pin on right side of mixer. If necessary, adjust control rod so rigging pin can be installed freely.

k. If control rod length is correct, lockwire, Item 199, Appendix D, adjustor to tube jamnut and rod end jamnut to tab on locking device.

l. Install self-retaining bolt and washers (under head) (PARA 11-1).

m. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

n. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

NOTE

When installing link, boltheads can face either direction.

o. At mixer end, install bushing through mixer arm clevis and install bolt, washer (under head), and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

p. At servo end, install long bushing through rod end and collective servo arm. Install 1-17/32-inch long bolt, washer, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

q. Install short bushings in slots on each side of rod end. Install a 1-21/32-inch long bolt, washers, and nut through bushings, rod end, and servo arm. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

r. Remove rigging pin from mixer.

s. Check area for cleanness and foreign material.

t. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

u. Close main rotor pylon sliding cover.

PITCH/TRIM

v. Open main rotor pylon sliding cover.

w. Unbolt link from mixer and pitch/trim assembly lever (Figure 11-110, Sheet 4, Detail B).

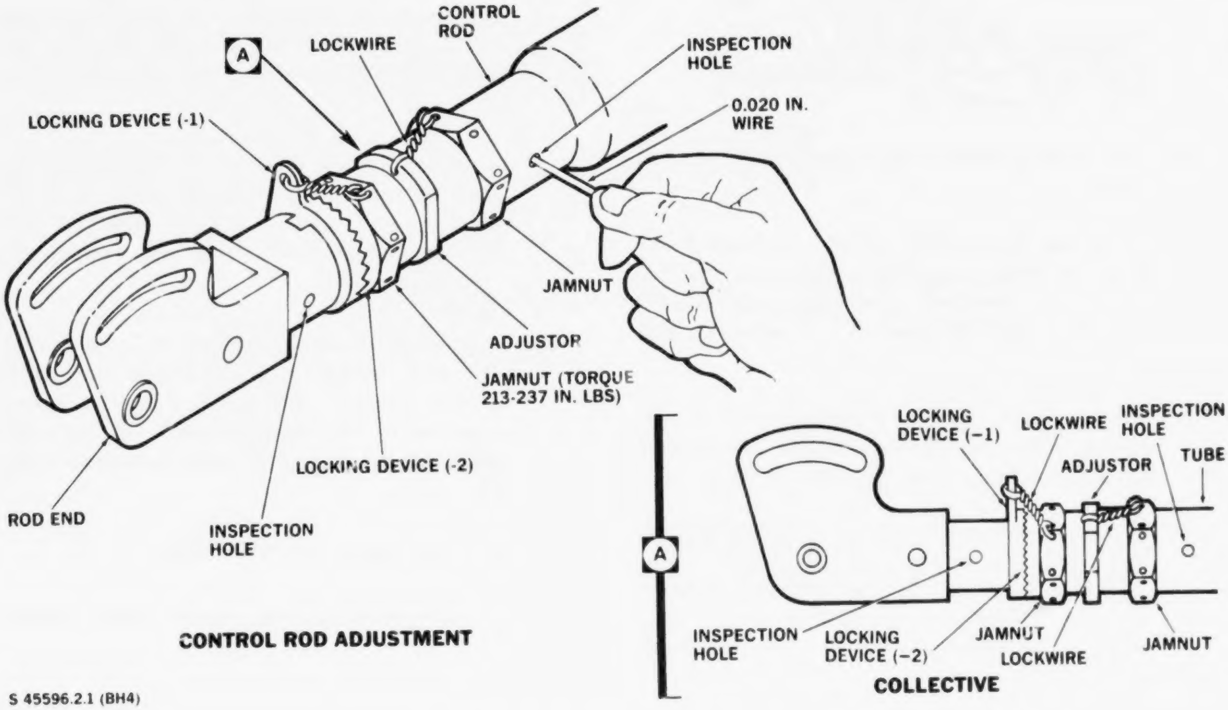

CONTROL ROD
A
LOCKWIRE
INSPECTION HOLE
LOCKING DEVICE (-1)
0.020 IN. WIRE
JAMNUT
ADJUSTOR
JAMNUT (TORQUE 213-237 IN. LBS)
LOCKING DEVICE (-2)
ROD END
INSPECTION HOLE
CONTROL ROD ADJUSTMENT
S 45596.2.1 (BH4)
A
LOCKING DEVICE (−1)
LOCKWIRE
INSPECTION HOLE
ADJUSTOR
TUBE
INSPECTION HOLE
LOCKING DEVICE (−2)
JAMNUT
LOCKWIRE
JAMNUT
COLLECTIVE

FIGURE 11-110 (SHEET 3 OF 8)

x. Install replacement link in mixer clevis and on pitch/trim assembly lever.

y. Install self-retaining bolt and washers (under head) (PARA 11-1).

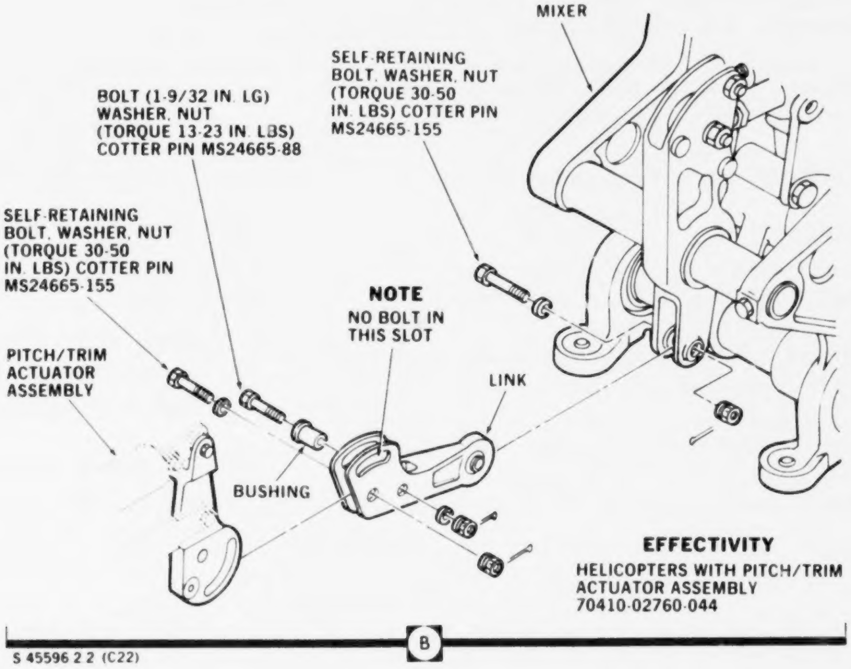
z. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

aa. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark (PARA 11-1).

ab. At pitch/trim actuator and SAS module assembly, install self-retaining bolt and washers (under head) (PARA 11-1).

ac. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

11-27.5 CONTROL RODS - SERVOS TO MIXER 11-27.5


MIXER
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-9/32 IN. LG) WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
PITCH/TRIM ACTUATOR ASSEMBLY
BUSHING
LINK
B
S 45596 2 2 (C22)

NOTE
NO BOLT IN THIS SLOT

EFFECTIVITY
HELICOPTERS WITH PITCH/TRIM ACTUATOR ASSEMBLY 70410-02760-044

FIGURE 11-110 (SHEET 4 OF 8)

ad. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ae. Install long bushing through link and slot in lever. Install 1-9/32-inch long bolt, washer, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

NOTE

Bolt cannot be installed through link slot on helicopters with pitch/trim actuator assembly, 70410-02760-044.

af. On helicopters with pitch trim assemblies, 70410-02760-045 or -047, install a short bushing in slot, each side of link. Install a 1-17/32-inch long bolt, washers and nut through bushings and lever. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88 (Figure 11-110, Sheet 3).

11-27.5 CONTROL RODS - SERVOS TO MIXER 11-27.5

ag. If only link is being replaced, check area for cleanness and foreign material.

ah. Inspect installed control rod for proper tri pivot bolt installation (PARA 11-1).

ai. Close main rotor pylon sliding cover.

ROLL ACTUATOR

aj. Open main rotor pylon sliding cover.

ak. Remove bolt, washer, bushing and nut from mixer lever (Detail C).

al. Unbolt lateral control rod from mixer lever.

am. Unbolt control rod from roll actuator lever.

INSPECT

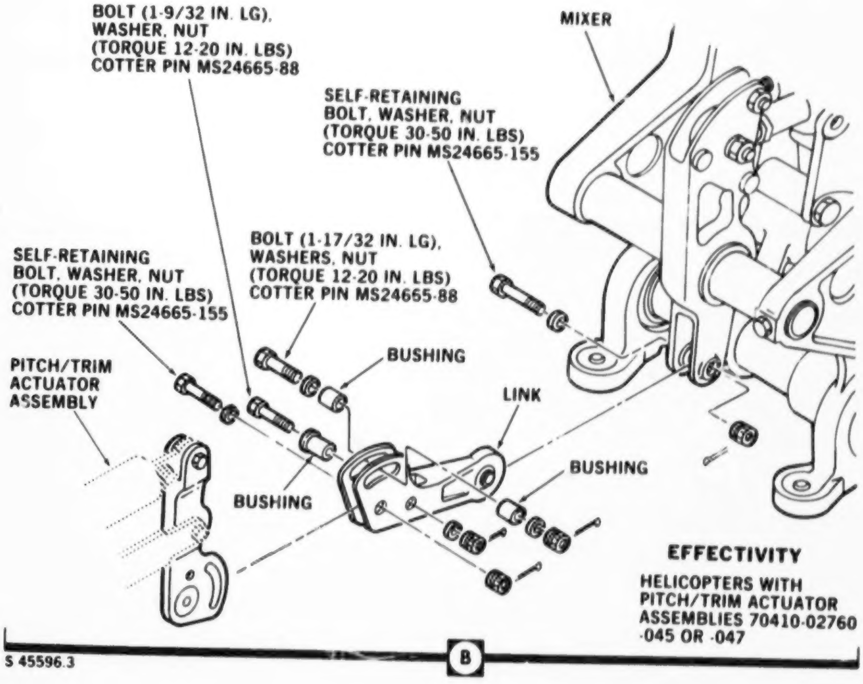
an. Inspect, replace or repair control rod (PARA 11-23).

INSTALL

ao. Adjust replacement control rod to exact length, hole-center to hole-center, as removed rod as follows (Figure 11-110, Sheet 7).

(1) Loosen jamnuts on tube and rod end (Figure 11-110, Sheet 7).

(2) Turn sleeve to lengthen or shorten control rod.


BOLT (1-9/32 IN. LG), WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
MIXER
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BOLT (1-17/32 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
BUSHING
PITCH/TRIM ACTUATOR ASSEMBLY
LINK
BUSHING
BUSHING
S 45596.3
B

EFFECTIVITY

HELICOPTERS WITH PITCH/TRIM ACTUATOR ASSEMBLIES 70410-02760 -045 OR -047

FIGURE 11-110 (SHEET 5 OF 8)

(3) Insert 0.020-inch wire in inspection hole in tube assembly. Adjusted sleeve must stop wire from passing through.

(4) Check that plastic spot in rod and keyway cannot be seen outside rod end jamnut.

(5) **TIGHTEN TUBE ASSEMBLY JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

(6) **TORQUE ROD END JAMNUT TO 213 - 237 INCH-POUNDS.**

(7) Do not lockwire now.

ap. Install control rod between mixer lever and actuator lever, with adjustable end at actuator.

NOTE

Boltheads can face either direction when installing bolts in control rod and actuator lever.

aq. Temporarily install self-retaining bolts at each end.

ar. Install rigging pin in roll actuator and a 5/16- by 36-inch rigging pin on right side of mixer. If necessary, adjust control rod so rigging pins can be installed.

as. If control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to tab of locking device.

at. Install self-retaining bolt and washers (under head) (PARA 11-1).

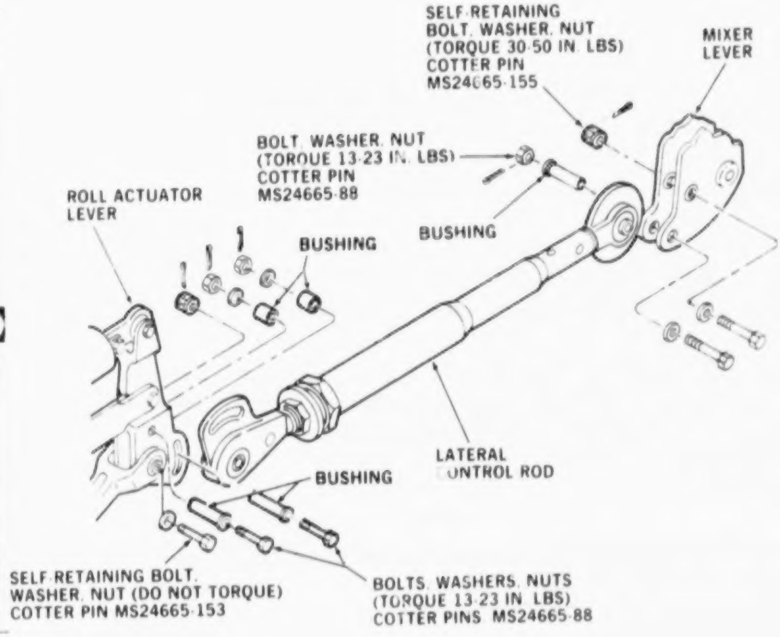
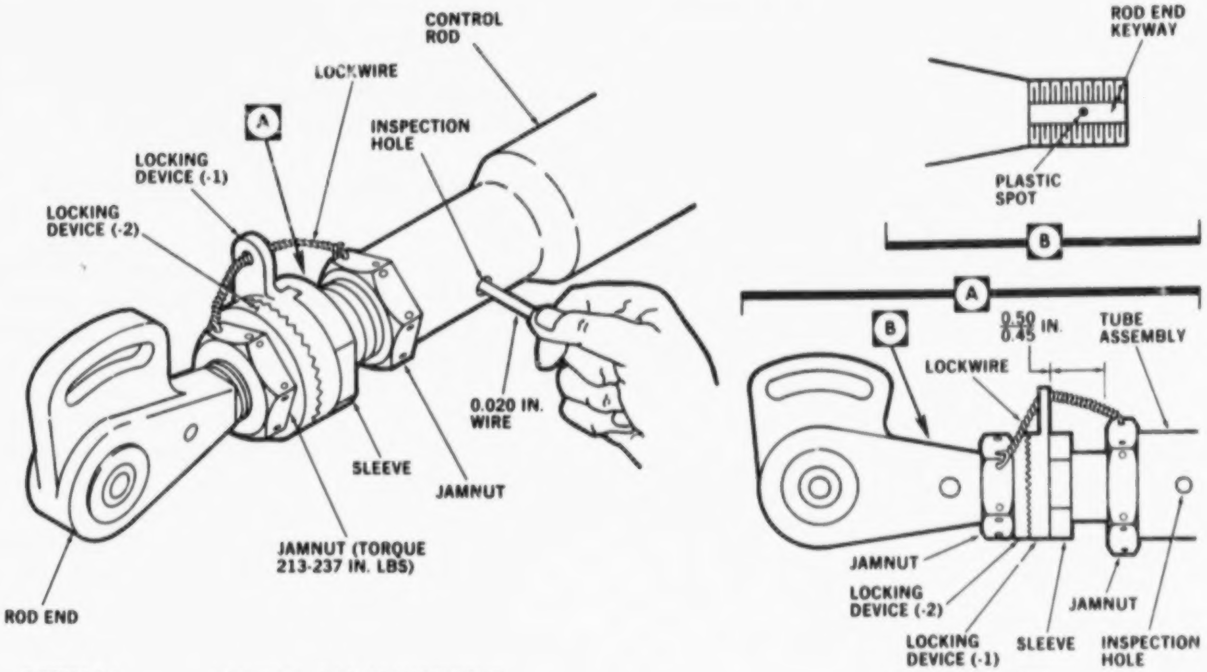

SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
MIXER LEVER
BOLT, WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
ROLL ACTUATOR LEVER
BUSHING
BUSHING
LATERAL CONTROL ROD
BUSHING
SELF-RETAINING BOLT, WASHER, NUT (DO NOT TORQUE) COTTER PIN MS24665-153
BOLTS, WASHERS, NUTS (TORQUE 13-23 IN. LBS) COTTER PINS MS24665-88
S 45596 4 (B)

FIGURE 11-110 (SHEET 6 OF 8)

11-27.5 CONTROL RODS - SERVOS TO MIXER 11-27.5


CONTROL ROD
LOCKWIRE
A
INSPECTION HOLE
LOCKING DEVICE (-1)
LOCKING DEVICE (-2)
0.020 IN. WIRE
SLEEVE
JAMNUT
JAMNUT (TORQUE 213-237 IN. LBS)
ROD END
ROD END KEYWAY
PLASTIC SPOT
B
A
B
$\frac{0.50}{0.45}$ IN.
TUBE ASSEMBLY
LOCKWIRE
JAMNUT
LOCKING DEVICE (-2)
JAMNUT
LOCKING DEVICE (-1)
SLEEVE
INSPECTION HOLE
S 45596.4.1

CONTROL ROD ADJUSTMENT

ROLL AND YAW

FIGURE 11-110 (SHEET 7 OF 8)

au. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

av. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aw. At mixer end, install bushing through mixer lever clevis and install bolt, washer (under head), and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

ax. At actuator end, install long bushing in actuator lever and rod end. Install 1-9/32-inch long bolt, washer, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

ay. Install a short bushing in slot, each side of actuator lever. Install a 1-17/32-inch long bolt, washers, and nut through bushing, rod end and roll actuator arm. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

az. Remove rigging pins from mixer and roll actuator.

ba. Check area for cleanness and foreign material.

bb. Inspect installed control rod for proper tripivot bolt installation (PARA 11-1).

bc. Close main rotor pylon cover.

11-27.5 CONTROL RODS - SERVOS TO MIXER 11-27.5

YAW SERVO

bd. Open main rotor pylon sliding cover.

be. Unbolt control rod from mixer lever and yaw servo (Figure 11-110, Sheet 8, Detail D).

bf. Adjust replacement control rod to exact length, hole-center to hole-center, as removed rod as follows: (Figure 11-110, Sheet 7)

(1) Loosen jamnuts on tube and rod end (Figure 11-110, Sheet 7).

(2) Turn sleeve to lengthen or shorten control rod.

(3) Insert a 0.020-inch wire in inspection hole in rod assembly. Adjusted sleeve must stop wire from passing through.

(4) Check that plastic spot in rod and keyway cannot be seen outside rod end jamnut.

(5) **TIGHTEN TUBE ASSEMBLY JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

(6) **TORQUE ROD END JAMNUT TO 213 - 237 INCH-POUNDS.**

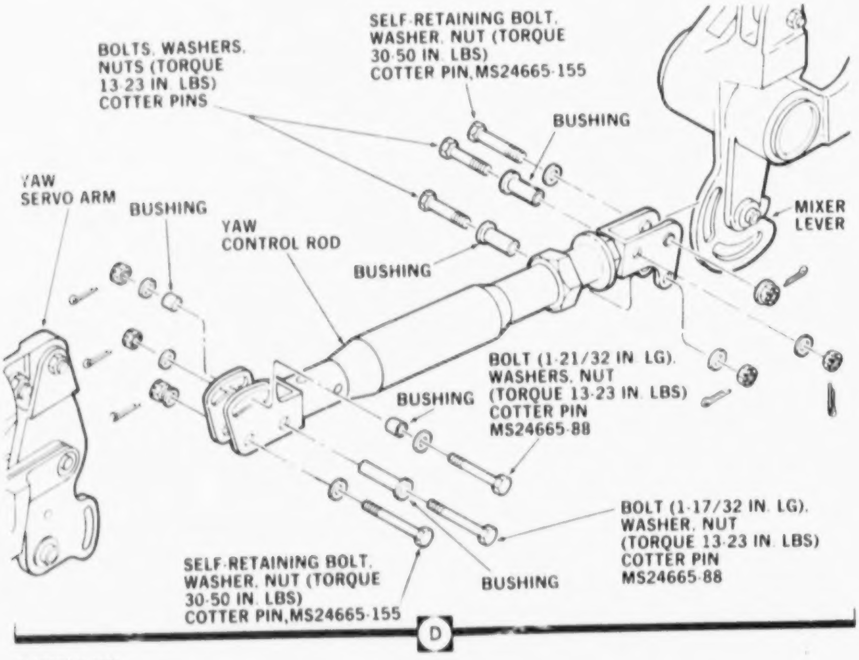
(7) Do not lockwire now.

bg. Install control rod between mixer arm and servo lever with adjustable end at mixer.

NOTE

When installing control rod, boltheads can face either direction.

bh. Temporarily install self-retaining bolts at each end. Put washers under each bolthead.


SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BOLTS, WASHERS, NUTS (TORQUE 13-23 IN. LBS) COTTER PINS
BUSHING
YAW SERVO ARM
BUSHING
YAW CONTROL ROD
MIXER LEVER
BUSHING
BOLT (1-21/32 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
BUSHING
BOLT (1-17/32 IN. LG), WASHER, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-88
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-155
BUSHING
D

S 45596.5 (C8)

FIGURE 11-110 (SHEET 8 OF 8)

11-27.5 CONTROL RODS - SERVOS TO MIXER 11-27.5

bi. Install rigging pin in yaw servo and a 5/16- by 12-inch rigging pin on left side of mixer. If necessary, adjust control rods rigging pins can be installed.

bj. When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to locking device tab.

bk. Install self-retaining bolt and washers (under head) (PARA 11-1).

bl. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

bm. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bn. At mixer end, install bushings through rod end and slots in mixer lever. Install bolts, washers, and nuts. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

bo. At servo end, install long bushing through rod end and yaw servo lever. Install 1-17/32-inch long bolt, washer, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

bp. Install short bushings in slots on each side of rod end. Install a 1-21/32-inch-long bolt, washers, and nut through bushings, rod end, and servo lever. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

bq. Remove rigging pin from mixer and from yaw servo.

br. Check area for cleanness and foreign material.

bs. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

bt. Close main rotor pylon cover.

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

a. Open main rotor pylon sliding cover.

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	–
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

b. Turn on electrical and hydraulic power (PARA 1-6.3).

c. Install rigging pins at four upper deck torque shafts, two rigging pins at pilot's cyclic stick and one rigging pin at yaw pedals (PARA 11-27.1).

FORWARD PRIMARY SERVO

d. Install damper rigging block at Red blade and tie to damper piston with tiedown strap (PARA 11-27.1).

e. Put Red blade (or spindle) at 90° position. Make sure blade index marks on swashplate are lined up.

NOTE

Slight pressure must be put on controls when measuring blade angle.

f. Hold collective stick down, cyclic stick rear/left, and pedal left. Record blade angle.

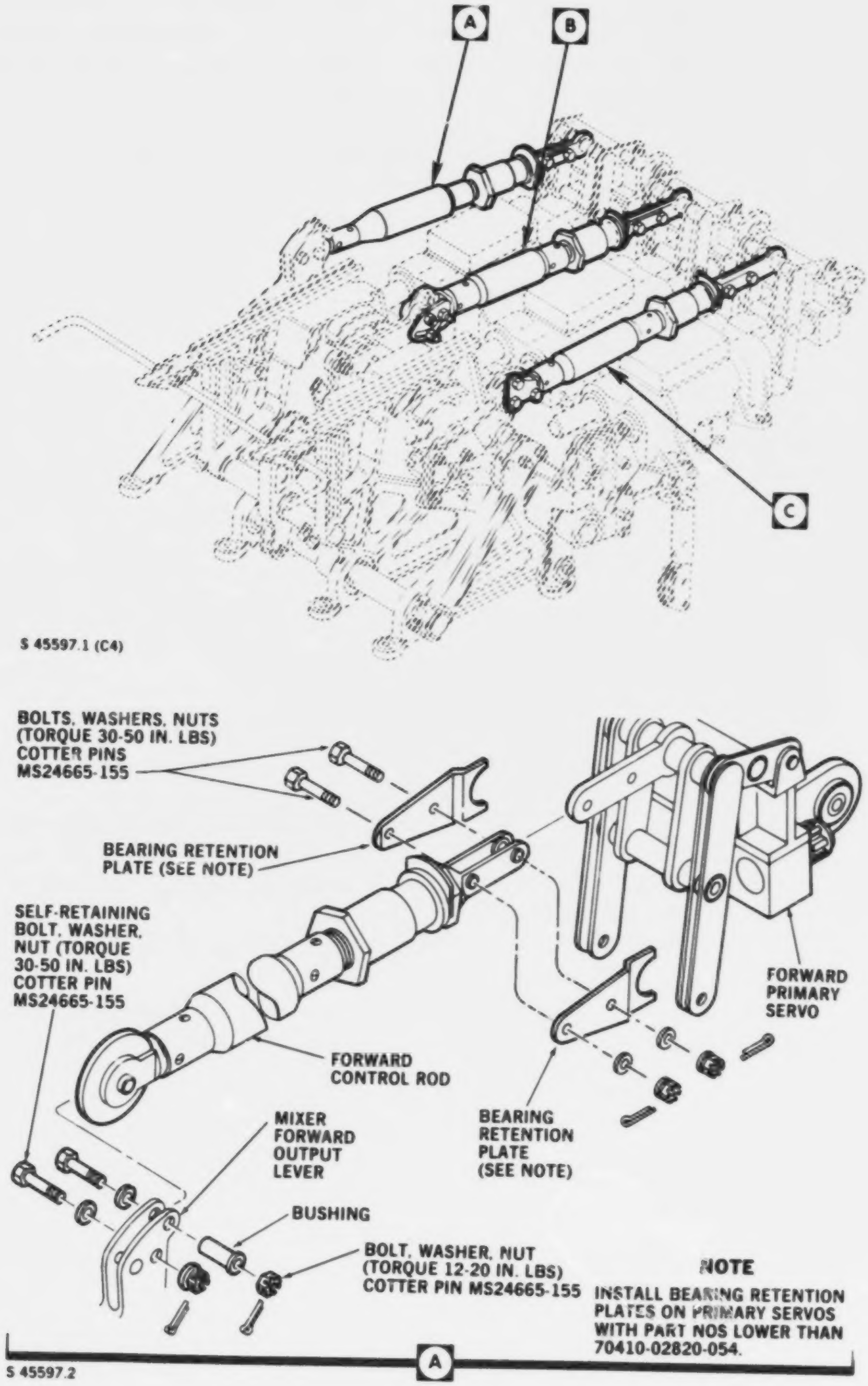
CAUTION

To prevent damage to swashplate do not remove primary servo input control rods with hydraulic power on.

g. Turn off all electrical and hydraulic power.

h. At mixer, remove bolt, washer, nut, and bushing from mixer arm (Figure 11-111, Sheet 1, Detail A).

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6


A
B
C
S 45597.1 (C4)
BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-155
BEARING RETENTION PLATE (SEE NOTE)
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155
FORWARD CONTROL ROD
MIXER FORWARD OUTPUT LEVER
BUSHING
BOLT, WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-155
BEARING RETENTION PLATE (SEE NOTE)
FORWARD PRIMARY SERVO
A
S 45597.2

NOTE

INSTALL BEARING RETENTION PLATES ON PRIMARY SERVOS WITH PART NOS LOWER THAN 70410-02820-054.

FIGURE 11-111 (SHEET 1 OF 4)

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

i. Unbolt forward control rod from mixer arm and forward primary servo.

INSPECT

j. Inspect, or repair control rod (PARA 11-23).

INSTALL

k. Adjust replacement control rod to exact length, hole-center to hole-center, as removed rod, as follows:

(1) Loosen jamnuts at each end of barrel. Slide locking devices away from barrel.

NOTE

Jamnut at tube assembly end has left-hand thread.

(2) Turn barrel to make control rod longer or shorter.

(3) **TORQUE BOTH JAMNUTS TO 95 - 105 INCH-POUNDS.**

(4) Insert 0.020-inch wire into two inspection holes in barrel. Wire must not pass through either hole.

(5) Do not lockwire now.

l. Install control rod between primary servo and mixer arm.

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of bolts are critical characteristics.

m. At primary servo end:

(1) On helicopters with primary servos, 70410-02820-044 through -053, install bearing retention plates, bolts, washers, and nuts. **TORQUE NUTS TO 50 - 100 INCH-POUNDS.** Install cotter pin, MS24665-155. Apply slippage mark.

(2) On helicopters with primary servos, 70410-02820-054 and subsequent, install bolts, washers, and nuts. **TORQUE NUTS TO 50 - 100 INCH-POUNDS.** Install cotter pin, MS24665-155. Apply slippage mark.

CAUTION

When installing bolt and washer, make sure retaining ring on bolt expands and holds washer without preloading it.

NOTE

Boltheads can face either direction when installing bolts in forward control rod and mixer forward output lever.

n. At mixer end, install self-retaining bolt and washers (under head) (PARA 11-1).

o. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

p. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

q. Install bushing in mixer forward output lever, flanged end toward left. Install bolt, washer (under bolthead), and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-155.

r. Turn on electrical and hydraulic power (PARA 1-6.3).

s. Make sure that blade angle readings taken on red blade have not changed after servo rod replacement. Adjust main rotor servo input rod as required to reproduce the angle previously measured within ±0.25°.

t. When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to locking device tab.

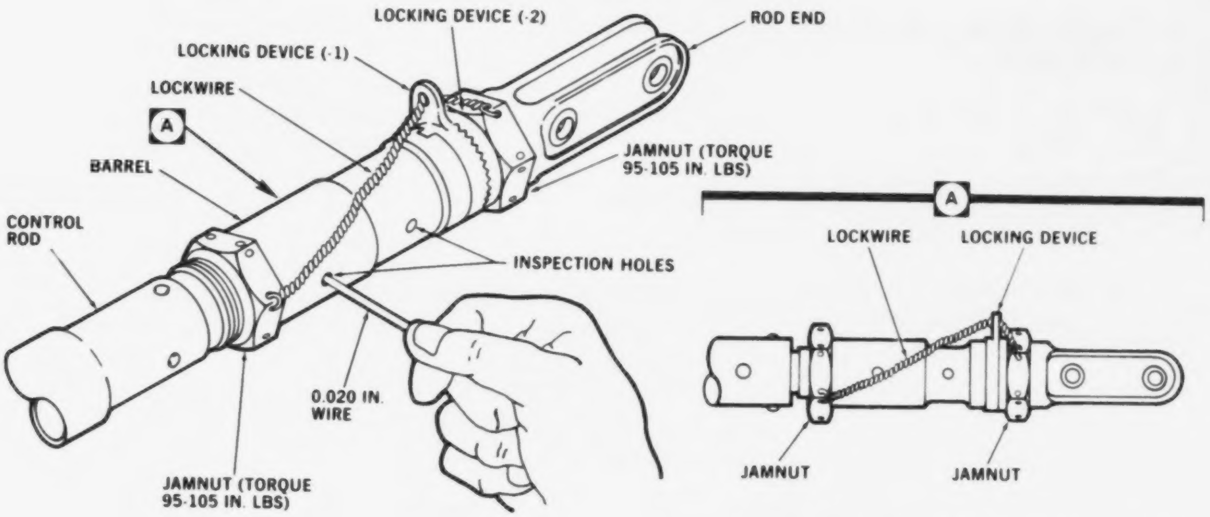
u. Remove rigging pins and damper block.

v. Turn off all electrical hydraulic power.

w. Check area for cleanness and foreign material.

x. Inspect installed control rod for proper tripivot bolt installation (PARA 11-1).

y. Close main rotor pylon sliding cover.


LOCKING DEVICE (-2)
ROD END
LOCKING DEVICE (-1)
LOCKWIRE
A
BARREL
JAMNUT (TORQUE 95-105 IN. LBS)
CONTROL ROD
INSPECTION HOLES
0.020 IN. WIRE
JAMNUT (TORQUE 95-105 IN. LBS)
A
LOCKWIRE
LOCKING DEVICE
JAMNUT
JAMNUT

LOCKWIRE-LOCKING DEVICE TO JAMNUTS

S 45597.2.1 (C4)

ADJUSTING PRIMARY SERVO CONTROL ROD

FIGURE 11-111 (SHEET 2 OF 4)

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

AFT PRIMARY SERVO

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	–
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

z. Open main rotor pylon sliding cover.

aa. Turn on electrical and hydraulic power (PARA 1-6.3).

ab. Install rigging pins at the four upper deck torque shafts, two at pilot's cyclic stick, and one at yaw pedals (PARA 11-27.1).

ac. Install damper rigging block at Red blade and tie to damper piston with tiedown strap.

ad. Put Red or spindle blade at the 90° position.

NOTE

Slight pressure must be put on controls when measuring blade angle.

ae. Hold collective stick down, cyclic stick rear-left, and pedal left. Record blade angle.

CAUTION

To prevent damage to swashplate do not remove primary servo input control rods with hydraulic power on.

af. Turn off all electrical and hydraulic power.

ag. Unbolt aft control rod from mixer arm and aft primary servo (Figure 11-111, Sheet 3, Detail B). Remove bushings.

INSPECT

ah. Inspect, or repair control rod (PARA 11-32).

INSTALL

ai. Adjust replacement control rod to exact length, hole-center to hole-center, as removed rod.

(1) Loosen jamnuts at each end of barrel. Slide locking devices away from barrel.

NOTE

Jamnut at tube assembly end has left-hand thread.

(2) Turn barrel to make control rod longer or shorter.

(3) **TORQUE BOTH JAMNUTS TO 95 - 105 INCH-POUNDS.**

(4) Insert 0.020-inch wire into two inspection holes in barrel. Wire must not pass through either hole.

(5) Do not lockwire now.

aj. Install control rod between primary servo and rear longitudinal output bellcrank.

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of nut are critical characteristics.

ak. At primary servo end:

(1) On helicopters with primary servos, 70410-02820-44 through -053, install bearing retention plates, bolts, washers, and nuts. **TORQUE NUTS TO 50 - 100 INCH-POUNDS.** Install cotter pin, MS24665-155. Apply slippage mark.

(2) On helicopters with primary servos, 70410-02820-054 and subsequent, install bolts, washers, and nuts. **TORQUE NUTS TO 50 - 100 INCH-POUNDS.** Install cotter pin, MS24665-155. Apply slippage mark.

CAUTION

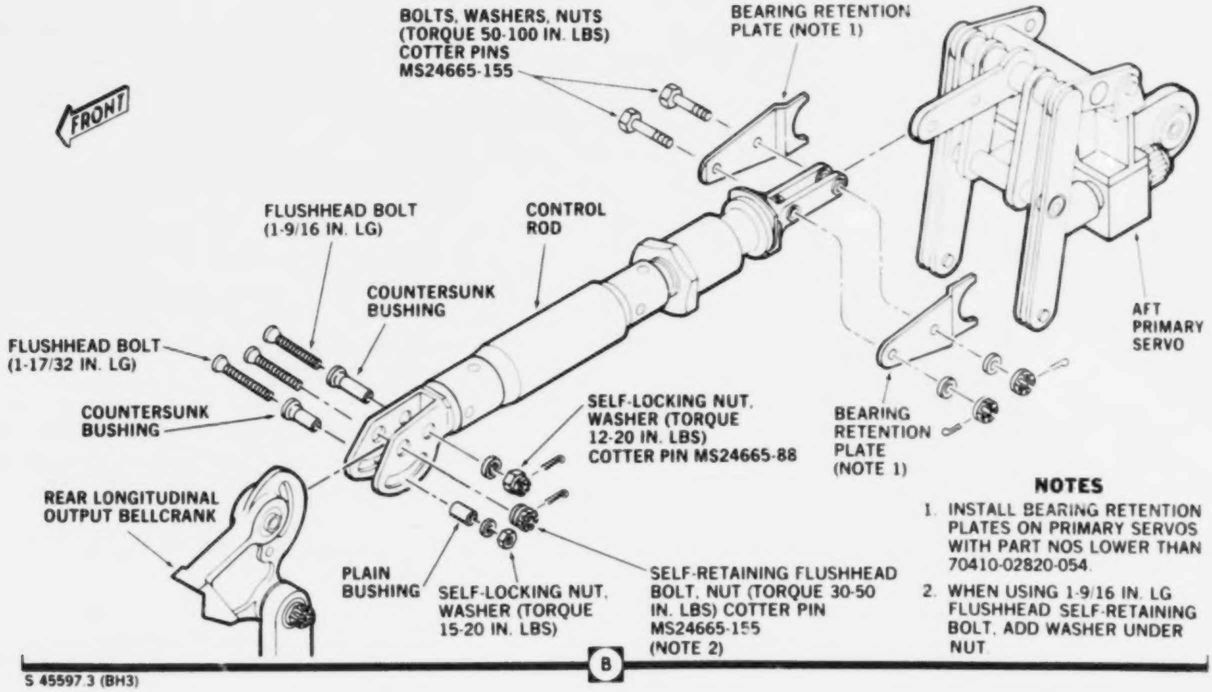
When installing bolt and washer, make sure retaining ring on bolt expands and holds washer without preloading it.

NOTE

All boltheads are toward right side.

al. When using 1-9/16 inch long flushhead self-retaining bolt, add washer under nut.

am. At output bellcrank end, install flushhead self-retaining bolt, (washer if required) and nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.


BOLTS, WASHERS, NUTS (TORQUE 50-100 IN. LBS) COTTER PINS MS24665-155
BEARING RETENTION PLATE (NOTE 1)
FRONT
FLUSHHEAD BOLT (1-9/16 IN. LG)
CONTROL ROD
COUNTERSUNK BUSHING
FLUSHHEAD BOLT (1-17/32 IN. LG)
COUNTERSUNK BUSHING
AFT PRIMARY SERVO
SELF-LOCKING NUT, WASHER (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
BEARING RETENTION PLATE (NOTE 1)
REAR LONGITUDINAL OUTPUT BELLCRANK
PLAIN BUSHING
SELF-LOCKING NUT, WASHER (TORQUE 15-20 IN. LBS)
SELF-RETAINING FLUSHHEAD BOLT, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-155 (NOTE 2)
B
S 45597.3 (BH3)

NOTES

1. INSTALL BEARING RETENTION PLATES ON PRIMARY SERVOS WITH PART NOS LOWER THAN 70410-02820-054.
2. WHEN USING 1-9/16 IN. LG FLUSHHEAD SELF-RETAINING BOLT, ADD WASHER UNDER NUT.

FIGURE 11-111 (SHEET 3 OF 4)

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

an. Install countersunk bushing through rod end right side and slot in mixer arm. Install 1-9/16 inch long flushhead bolt, washer, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24995-88.

NOTE

When torquing self-locking nuts, check and record amount of torque necessary to thread nut onto bolt before it touches washer. Add this torque to the given torque for the nut.

ao. Install a short plain bushing in slot, left side of rod end. Install countersunk bushing (countersunk side facing out) in slot, right side of rod end. Install 1-17/32 inch long flushhead bolt, washers, and nut.

ap. **TORQUE NUT TO 15 - 20 INCH-POUNDS.**

aq. Turn on electrical and hydraulic power (PARA 1-6.3).

ar. Make sure blade angle readings taken on red blade have not changed after servo rod replacement. Adjust main rotor servo input rod as necessary to reproduce angles previously measured within ±0.25°.

as. When control rod length is correct, lockwire jamnuts to locking device tab, Appendix D, Item 199.

at. Remove rigging pins and damper blocks.

au. Turn off all electrical and hydraulic power.

av. Check area for cleanness and foreign material.

aw. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

ax. Close main rotor pylon sliding cover.

LATERAL PRIMARY SERVO

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	-
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

ay. Open main rotor pylon sliding cover.

az. Turn on all electrical and hydraulic power (PARA 1-6.3).

ba. Install rigging pins at the four upper deck torque shafts, two at the base of pilot's cyclic stick, and one at yaw pedals (PARA 11-27.1).

bb. With rotor blades installed, install damper rigging block on Red blade and tie with tiedown strap. Block not required with blades off.

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

bc. Put red blade at the 0° position.

NOTE

Slight pressure must be put on controls when measuring blade angle.

bd. Hold collective stick down, cyclic stick rear-left, and pedal left. Record blade angle.

CAUTION

To prevent damage to swashplate do not remove primary servo input control rods with hydraulic power on.

be. Turn off all electrical and hydraulic power.

bf. Unbolt lateral control rod from mixer arm and lateral primary servo (Figure 11-111, Sheet 4, Detail C).

INSPECT

bg. Inspect, or repair control rod (PARA 11-32).

INSTALL

bh. Adjust replacement control rod to exact length, hole-center to hole-center, as removed rod, as follows:

(1) Loosen jamnuts at each end of barrel. Slide locking devices away from barrel.

NOTE

Jamnut at tube assembly end has left-hand thread.

(2) Turn barrel to make control rod longer or shorter.

(3) **TORQUE BOTH JAMNUTS TO 95 - 105 INCH-POUNDS.**

(4) Insert 0.020-inch wire into two inspection holes in barrel. Wire must not pass through either hole.

(5) Do not lockwire now.

bi. Install control rod between primary servo and mixer arm.

WARNING

FLIGHT SAFETY PARTS

Verification of minimum torque and safety of nut are critical characteristics.

NOTE

Boltheads can face either direction when installing bolts in mixer lateral lever and control rod.

bj. At primary servo end:

(1) On helicopters with primary servos, 70410-02820-044 through -053, install bearing retention plates, bolts, washers, and nuts. **TORQUE NUTS TO 50 - 100 INCH-POUNDS.** Install cotter pin, MS24665-155. Apply slippage mark.

(2) On helicopters with primary servos, 70410-02820-054 and subsequent, install bolts, washers, and nuts. **TORQUE NUTS TO 50 - 100 INCH-POUNDS.** Install cotter pin, MS24665-155. Apply slippage mark.

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6

CAUTION

When installing bolt and washer, make sure retaining ring on bolt expands and holds washer without preloading it.

bk. At mixer end, install flathead self-retaining bolt and nut. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

NOTE

Bolthead must face toward right side.

bl. Install long bushing through rod end and slot in mixer arm. Install 1-13/32 inch long bolt, washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

bm. Install a short bushing in slot, each side of rod end. Install 1-21/32 inch bolt, washer, nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-88.

bn. Turn on electrical and hydraulic power (PARA 1-6.3).

bo. Make sure blade angle readings taken on red blade have not changed after servo rod replacement.

CAUTION

To prevent damage to components do not remove control rod with hydraulic power on.

bp. Adjust main rotor servo input rod as necessary to reproduce angle previously measured within ±0.025°.

bq. When control rod length is correct, lockwire, Item 199, Appendix D, jamnuts to locking device tab.

br. Remove rigging pins and damper block.

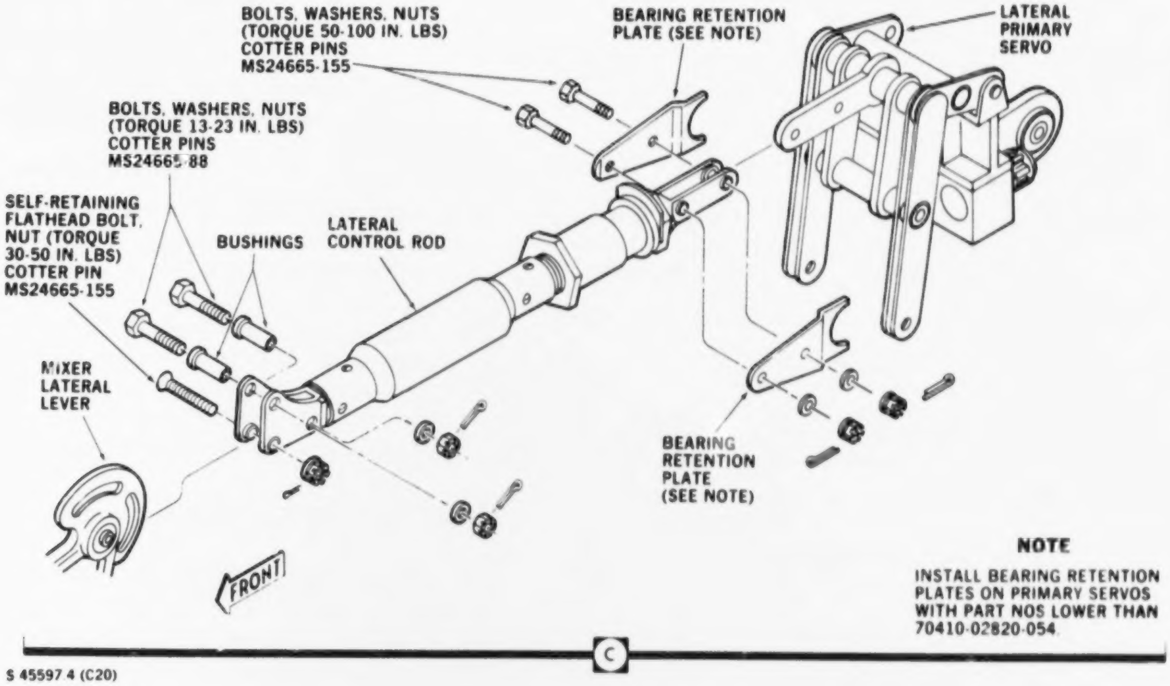
bs. Turn off all electrical and hydraulic power.

bt. Check area for cleanness and foreign material.

bu. Inspect installed control rod for proper tri pivot bolt installation (PARA 11-1).

bv. Close main rotor pylon sliding cover.

11-27.6 REPLACE CONTROL RODS - MIXER TO PRIMARY SERVOS 11-27.6


BOLTS, WASHERS, NUTS
(TORQUE 50-100 IN. LBS)
COTTER PINS
MS24665-155
BEARING RETENTION
PLATE (SEE NOTE)
LATERAL
PRIMARY
SERVO
BOLTS, WASHERS, NUTS
(TORQUE 13-23 IN. LBS)
COTTER PINS
MS24665-88
SELF-RETAINING
FLATHEAD BOLT,
NUT (TORQUE
30-50 IN. LBS)
COTTER PIN
MS24665-155
BUSHINGS
LATERAL
CONTROL ROD
MIXER
LATERAL
LEVER
BEARING
RETENTION
PLATE
(SEE NOTE)
FRONT
C
S 45597.4 (C20)

NOTE

INSTALL BEARING RETENTION PLATES ON PRIMARY SERVOS WITH PART NOS LOWER THAN 70410-02820-054.

FIGURE 11-111 (SHEET 4 OF 4)

11-27.7 REPLACE CONTROL RODS - MIXER TO FORWARD QUADRANT 11-27.7

REMOVE

NOTE

For application of hydraulic and electrical power to move flight controls, refer to PARA 11-27.1.

a. Remove soundproofing panels at station 311 in cabin ceiling (PARA 2-32).

b. Remove main rotor pylon sliding cover.

c. Unbolt yaw push rod from mixer lever and yaw lever.

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

d. Install bolt replacement rod between mixer lever and yaw lever (Figure 1-112, Sheet 1, Detail A).

e. Install self-retaining bolt and washers (under head) (PARA 11-1).

f. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

g. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

h. At each end, install long bushing through rod ends and slots in levers. Install bolts, washers, nuts. **TORQUE NUTS TO 12 - 20 INCH-POUNDS.** Install cotter pins, MS24665-88.

i. Install short bushings in slot, each side of rod end. Install bolts, washers and nuts. **TORQUE NUTS TO 12 - 20 INCH-POUNDS.** Install cotter pins, MS24665-88.

j. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

REMOVE

k. Unbolt adjustable rod from between yaw lever and forward quadrant lever as follows (Figure 11-112, Sheet 2, Detail B):

(1) Remove forward fairing around tail rotor servo.

(2) Release spring tension in spring cylinders. Use alternate method procedures in PARA 11-28.

l. Raise collective stick to midposition and install collective boost servo rigging pin. Lock pilot's collective friction lock.

m. Install 1/4- by 6-inch rigging pin in tail rotor servo input arm.

n. Remove access panels from rear section of tail cone at station 640.

o. Disconnect tail rotor cables at cable disconnects.

p. Loosen jamnut on control rod.

q. Disconnect front end of control rod from torque shaft lever (Figure 11-112, Sheet 2, Detail B).

r. Disconnect rear end of control rod from forward quadrant.

11-27.7 REPLACE CONTROL RODS - MIXER TO FORWARD QUADRANT 11-27.7

NOTE

Control rod must be taken out in two pieces.

s. Loosen adjustable stop on torque shaft lever. Turn stop fully in until bolthead bottoms on torque shaft lever.

t. Move tail rotor pedals full right, to move torque shaft lever aside.

u. Move forward quadrant aft as required and unscrew control rod from rod end. Count and record number of turns it takes to remove control rod.

v. Remove control rod.

INSTALL

w. Move tail rotor pedals to full right. Install replacement control rod, rod end to forward quadrant.

x. Install self-retaining bolt and washers (under head) (PARA 11-1).

y. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

z. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aa. Install long bushing through rod end and slots in lever. Install bolt, washer, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-153.

ab. Install short bushing in slot of rod end. Install bolt, washer, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-153.

ac. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

ad. Apply corrosion preventive compound, Item 120, Appendix D, to threads of control rod.

ae. Screw control rod onto rod end, same number of turns as was required to remove control rod. Do not tighten control rod jamnut now.

af. Temporarily connect front part of control rod to torque shaft lever with self-retaining bolt, washer, and nut. Do not torque now.

ag. Install yaw boost servo rigging pin.

ah. Install 5/16- by 12-inch rigging pin in left side of mixer (PARA 11-27.1).

ai. Check to see if alignment marks (rigging notch) on outside diameter of forward quadrant lines up with center of cable guard pin. If not, readjust rod until marks line up.

aj. Insert a 0.020-inch lockwire into inspection hole in adjustable rod end. The adjusted thread end must stop wire from passing through inspection hole.

ak. After marks line up, install self-retaining bolt and washers (under head) (PARA 11-1).

al. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-155.

am. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

an. Install long bushing through rod end and slots in lever. Install bolt, washer, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-153.

11-27.7 REPLACE CONTROL RODS - MIXER TO FORWARD QUADRANT 11-27.7

ao. Install short bushing in slot of rod end. Install bolt, washer and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin MS24665-153.

ap. **TIGHTEN JAMNUT ON CONTROL ROD 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

aq. Connect cables at cable disconnects and lockwire, Item 198, Appendix D, (PARA 11-28).

ar. After alignment is made, check to see if tail rotor servo rigging pin can be easily removed. Check yaw mixer rigging pin to make sure it can be easily removed. If not, do a rig check of tail rotor (PARA 11-2).

as. Remove all rigging pins except collective boost servo pin.

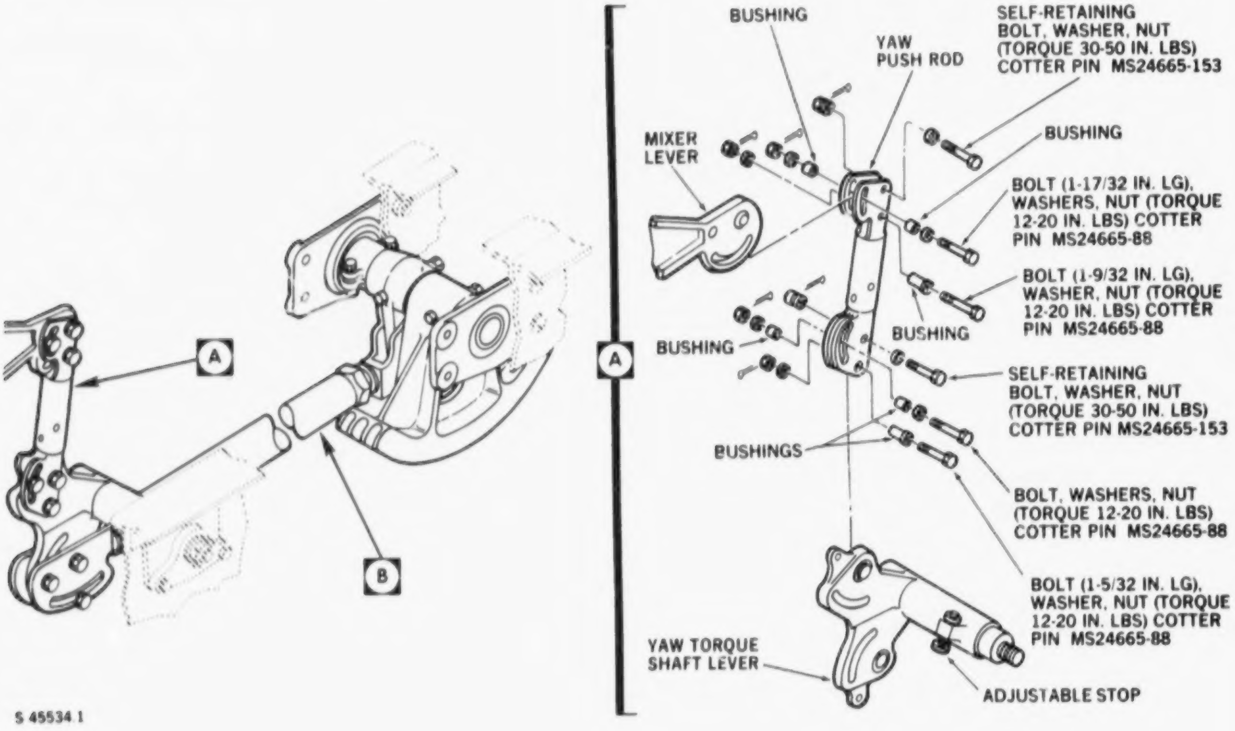

A
B
S 45534.1
A
BUSHING
YAW PUSH ROD
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
MIXER LEVER
BUSHING
BOLT (1-17/32 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
BOLT (1-9/32 IN. LG), WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
BUSHING
BUSHING
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BUSHINGS
BOLT, WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
BOLT (1-5/32 IN. LG), WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-88
YAW TORQUE SHAFT LEVER
ADJUSTABLE STOP

FIGURE 11-112 (SHEET 1 OF 2)

11-27.7 REPLACE CONTROL RODS - MIXER TO FORWARD QUADRANT 11-27.7

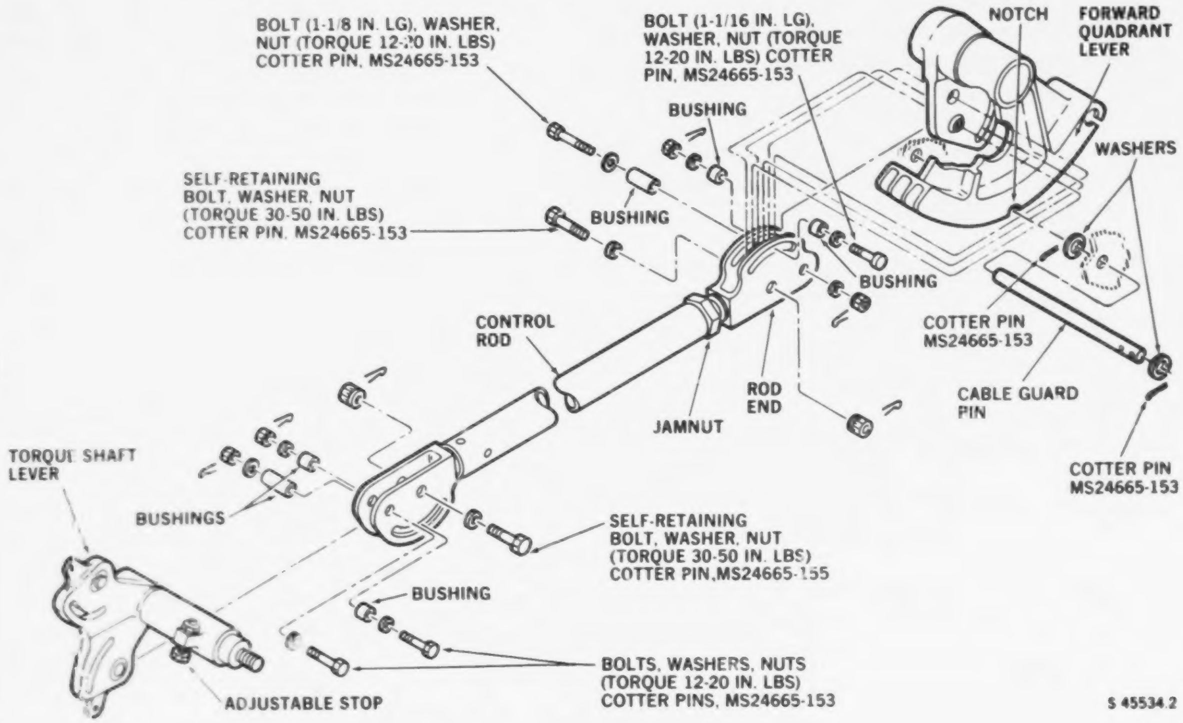

BOLT (1-1/8 IN. LG), WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN, MS24665-153
BOLT (1-1/16 IN. LG), WASHER, NUT (TORQUE 12-20 IN. LBS) COTTER PIN, MS24665-153
NOTCH
FORWARD QUADRANT LEVER
BUSHING
WASHERS
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN, MS24665-153
BUSHING
BUSHING
CONTROL ROD
COTTER PIN MS24665-153
CABLE GUARD PIN
ROD END
JAMNUT
TORQUE SHAFT LEVER
COTTER PIN MS24665-153
BUSHINGS
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN,MS24665-155
BUSHING
BOLTS, WASHERS, NUTS (TORQUE 12-20 IN. LBS) COTTER PINS, MS24665-153
ADJUSTABLE STOP
S 45534.2

FIGURE 11-112 (SHEET 2 OF 2)

at. Push right pedal until tail rotor servo bottoms on internal stop. Adjust right pedal stop bolt at torque shaft lever to contact stop. Lockwire bolt, Item 199, Appendix D.

au. Connect spring cylinders by alternate method procedures (PARA 11-28).

av. Remove collective boost servo rigging pin. Check to make sure all rigging pins have been removed.

aw. Inspect installed control rod for proper tri pivot bolt installation (PARA 11-1).

ax. Do an operational check of tail rotor flight control system (TM 55-1520-237-T).

ay. Check area for cleanness and foreign material.

az. Install tail rotor servo forward fairing.

ba. Install access panels on rear section of tail cone.

bb. Install main rotor pylon sliding cover.

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

WARNING

FLIGHT SAFETY PARTS

All self-retaining bolts, bellcranks, tierods, connecting links, control rods, bellcrank supports, and support fittings contain critical surfaces which must not be damaged during replacement of control rods and links. Provide protective covering as required.

REMOVE FORWARD CONTROL ROD

a. Open main rotor pylon sliding cover.

b. Remove main gear box fairings to access swashplate links at bellcranks (PARA 11-27).

c. Turn on electrical and hydraulic power (PARA 1-6.3).

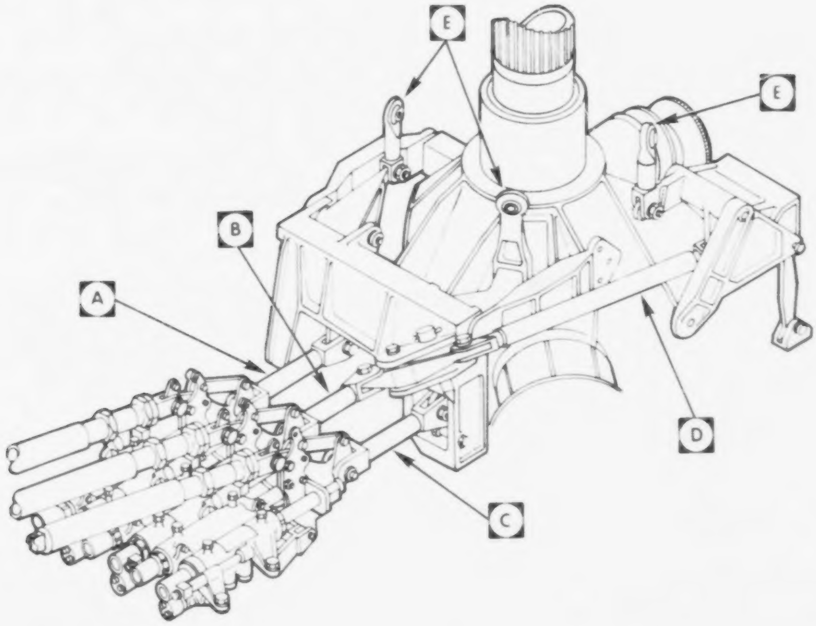
d. Raise collective to raise swashplate if necessary.

e. Install wooden blocks between swashplate and main gear box, to support swashplate while removing control rods or links.

CAUTION

Do not apply down collective with blocks installed.

f. Turn off all electrical and hydraulic power.



S 45535 1 (B)

FIGURE 11-113 (SHEET 1 OF 6)

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

CAUTION

To remove special bolt from large push rods, first remove nut. Use a 3/16-inch Allen wrench to push pin in bolthead. This will release retaining balls on threaded end of bolt so bolt can be removed. Balls must be released to install bolt also.

g. Unbolt forward control rod from forward bellcrank.

h. Unbolt forward control rod from primary servo and bellcrank (Figure 11-113, Sheet 2, Detail A).

INSPECT

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal in a critical characteristics area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

i. Visually inspect entire surface of forward control rod (PARA 11-32).

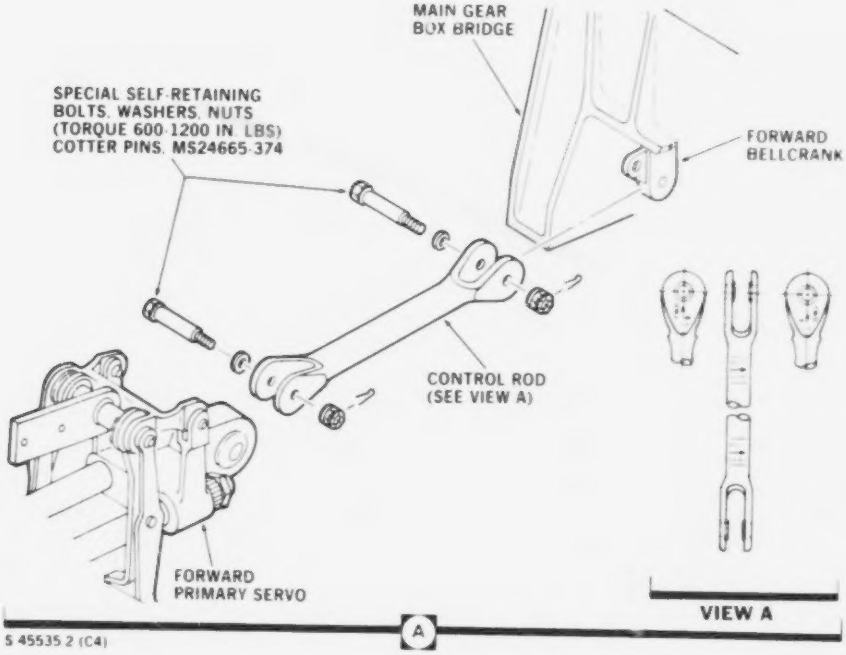

MAIN GEAR BOX BRIDGE
SPECIAL SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 600-1200 IN. LBS) COTTER PINS, MS24665-374
FORWARD BELLCRANK
CONTROL ROD (SEE VIEW A)
FORWARD PRIMARY SERVO
VIEW A
A
S 45535 2 (C4)

FIGURE 11-113 (SHEET 2 OF 6)

j. Visually inspect special self-retaining bolts grip length surface (PARA 11-32).

k. Visually inspect forward link lug area surfaces (PARA 11-32).

INSTALL FORWARD CONTROL ROD

l. Place replacement control rod between primary servo and bellcrank.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self retaining bolts are critical characteristics.

NOTE

- Position control rod according to decal on it.
- Add washers under bolthead, as necessary, to be sure nut is bottomed against control rod and not on bolt.

m. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

n. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

o. Install nuts. **TORQUE NUTS TO 600 - 1200 INCH-POUNDS.** Install cotter pins, MS24665-374.

p. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

q. Place forward link over bellcrank.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self retaining bolts are critical characteristics.

NOTE

Add washers under bolthead as necessary, to be sure nut is bottomed on link and not on bolt.

r. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

s. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

t. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

u. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

REMOVE AFT CONTROL ROD

v. Unbolt aft control rod from primary servo and bellcrank (Figure 11-113, Sheet 3, Detail B).

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

INSPECT

WARNING

FLIGHT SAFETY PARTS

Do not attempt to repair damage that penetrates into base metal in critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base meal that are within the critical characteristic area are to be replaced. Refer to APRA 11-32 for critical characteristic areas.

w. Visually inspect entire surface of aft control rod (PARA 11-32).

x. Visually inspect special self-retaining bolts grip length surface (PARA 11-32).

INSTALL AFT CONTROL ROD

y. Place replacement rod between servo and walking beam.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

NOTE

- Position control rod according to decal on it.
- Add washers under bolthead, as necessary, to be sure nut is bottomed against control rod and not on bolt.

z. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

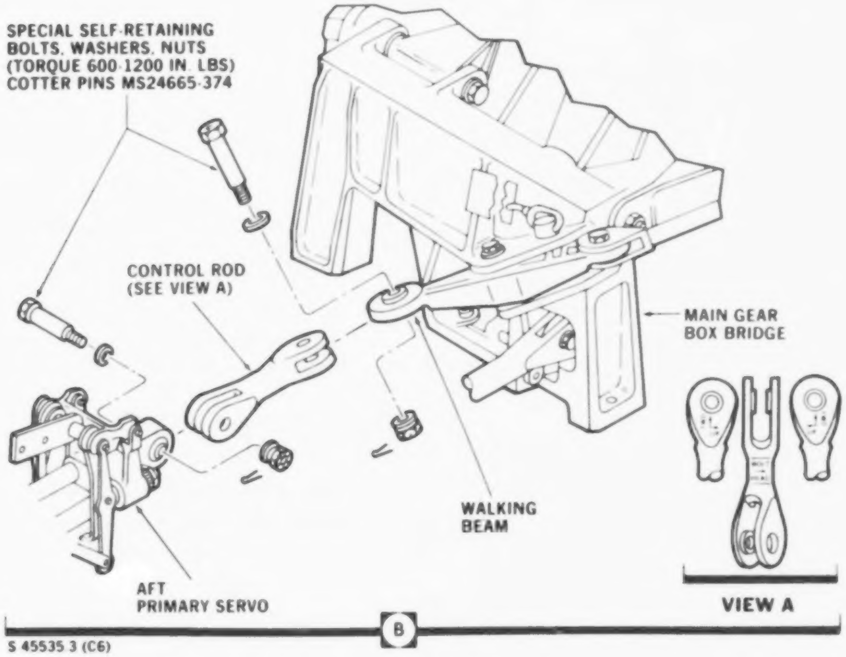

SPECIAL SELF-RETAINING
BOLTS, WASHERS, NUTS
(TORQUE 600-1200 IN. LBS)
COTTER PINS MS24665-374
CONTROL ROD
(SEE VIEW A)
MAIN GEAR
BOX BRIDGE
WALKING
BEAM
AFT
PRIMARY SERVO
VIEW A
B
S 45535 3 (C6)

FIGURE 11-113 (SHEET 3 OF 6)

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

aa. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

ab. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

ac. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

REMOVE LATERAL CONTROL ROD

ad. Unbolt lateral link from lateral bellcrank. Remove spacer.

ae. Unbolt lateral control rod from primary servo and bellcrank (Figure 11-113, Sheet 4, Detail C).

INSPECT

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal in a critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

af. Visually inspect entire surface of control rod surface (PARA 11-32).

ag. Visually inspect self-retaining bolt grip length surface (PARA 11-32).

ah. Visually inspect special lateral link lug area surfaces (PARA 11-32).

INSTALL LATERAL CONTROL ROD

ai. Put replacement control rod between primary servo and bellcrank.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

NOTE

- Position control rod according to decals on it.
- Add washer under bolthead, as necessary, to be sure nut bottoms against control rod and not on bolt.

aj. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin postion.

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

ak. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup

al. Install nut. **TORQUE NUTS TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-347.

am. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

an. Put lateral link over lateral bellcrank. Install spacer in link and bellcrank.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

NOTE

Add washer under bolthead, as necessary, to be sure nut bottoms against control rod and not on bolt.

ao. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin postion.

ap. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

aq. Install nut. **TORQUE NUTS TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-347.

ar. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

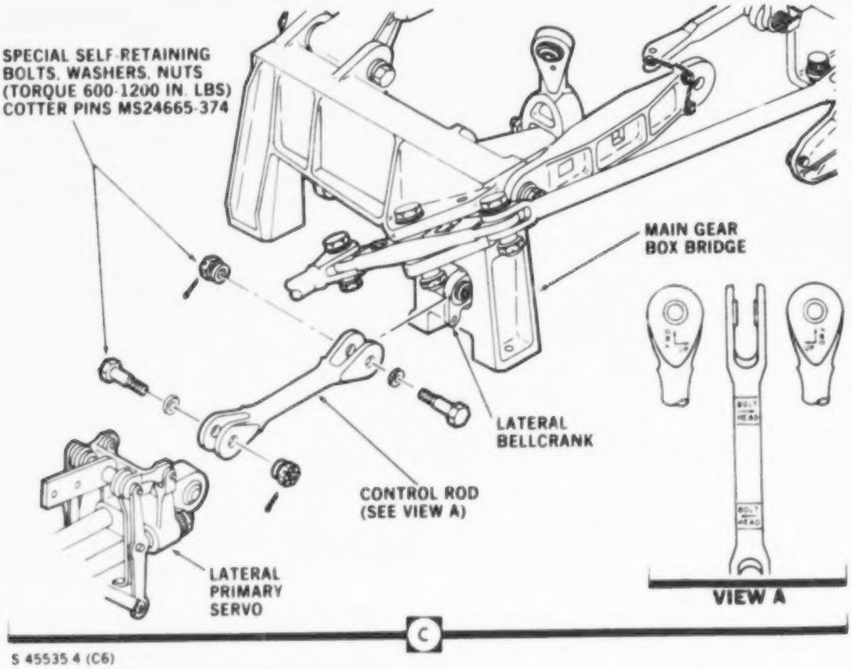

SPECIAL SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 600-1200 IN. LBS) COTTER PINS MS24665-374
MAIN GEAR BOX BRIDGE
LATERAL BELLCRANK
CONTROL ROD (SEE VIEW A)
LATERAL PRIMARY SERVO
BOLT HEAD
BOLT HEAD
VIEW A
C
S 45535 4 (C6)

FIGURE 11-113 (SHEET 4 OF 6)

REMOVE LONG CONTROL ROD

as. Unbolt long control rod from walking beam and aft bellcrank (Figure 11-113, Sheet 5, Detail D).

INSPECT

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal ina critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

at. Visually inspect entire surface of long control rod (PAR 11-32).

au. Visually inspect special self-retaining bolts grip length surface (PARA 11-32).

INSTALL LONG CONTROL ROD

av. Install replacement rod between walking beam and aft bellcrank.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

aw. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

ax. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

NOTE

Add washers under bolthead, as necessary, to be sure nut bottoms on rod and not on bolt.

ay. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pins, MS24665-374.

az. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

INSPECT LINKS

NOTE

If bearing is cracked do not remove expandable pin.

ba. Inspect spherical bearings on all three link assemblies for cracks. **REPLACE ANY LINK ASSEMBLY WITH MORE THAN ONE CRACK.**

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation and torque of nut is a critical characteristic.

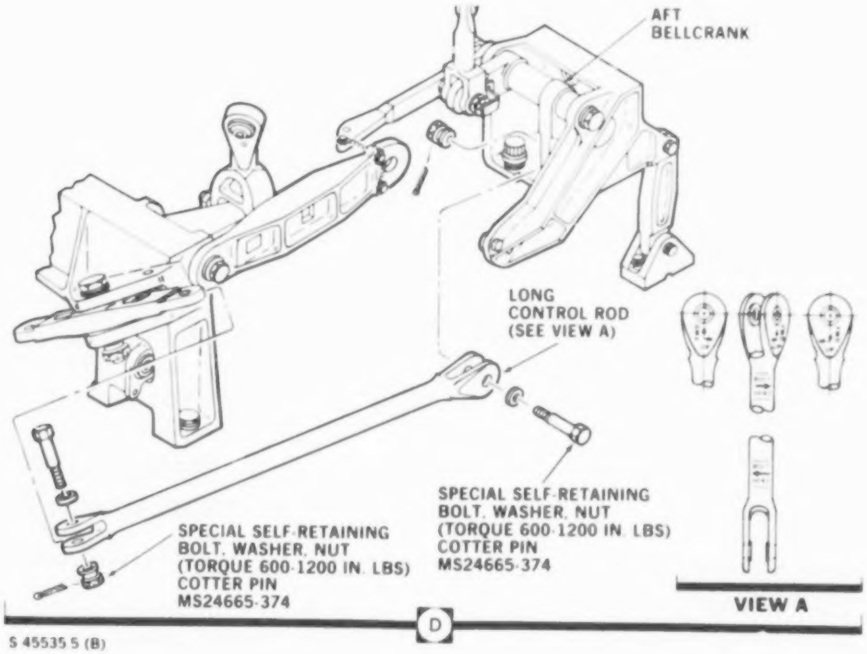
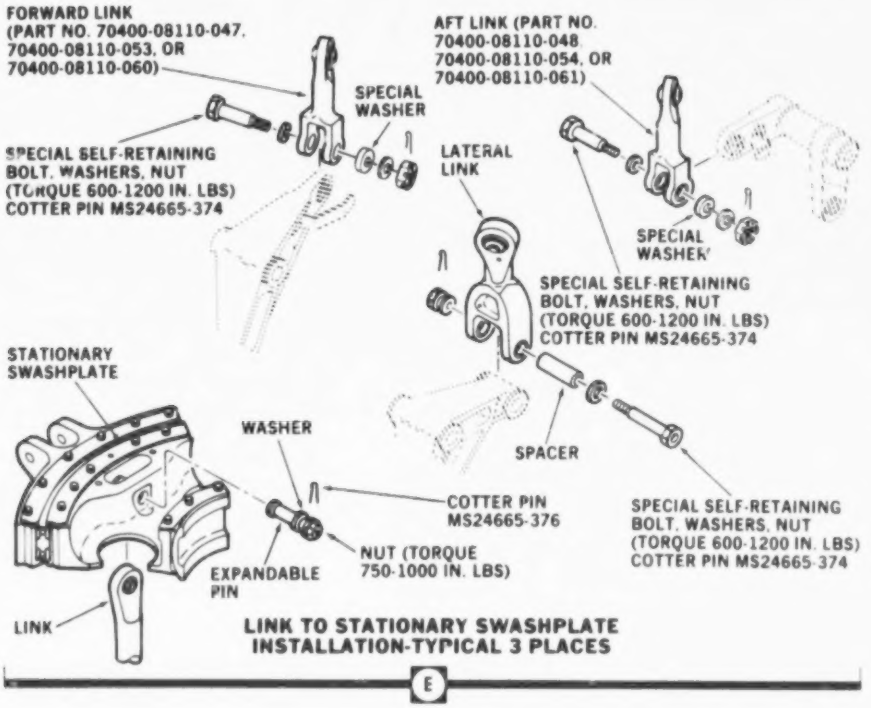

AFT BELLCRANK
LONG CONTROL ROD (SEE VIEW A)
SPECIAL SELF-RETAINING BOLT, WASHER, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
SPECIAL SELF-RETAINING BOLT, WASHER, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
VIEW A
D
S 45535 5 (B)

FIGURE 11-113 (SHEET 5 OF 6)

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8


FORWARD LINK (PART NO. 70400-08110-047, 70400-08110-053, OR 70400-08110-060)
AFT LINK (PART NO. 70400-08110-048, 70400-08110-054, OR 70400-08110-061)
SPECIAL WASHER
SPECIAL SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
LATERAL LINK
SPECIAL WASHER
SPECIAL SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
STATIONARY SWASHPLATE
WASHER
SPACER
COTTER PIN MS24665-376
SPECIAL SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
NUT (TORQUE 750-1000 IN. LBS)
EXPANDABLE PIN
LINK
LINK TO STATIONARY SWASHPLATE INSTALLATION-TYPICAL 3 PLACES
E

S 45535.6 (BH4)

FIGURE 11-113 (SHEET 6 OF 6)

WARNING

FLIGHT SAFETY PARTS

Verification of torque, gap under washer, and installation of expandable pin, split lock ring and half male spacer are critical characteristics.

bb. Inspect gap between expandable pin and washer using feeler gage. **GAP MUST NOT EXCEED 0.002 INCH.** If gap exceeds 0.002 inch remove expandable pin and reinstall. **TORQUE NUT TO 750 - 1000 INCH-POUNDS.** If gap is less than 0.002 inch, bolt is locked in place.

bc. **REPLACE LINK ASSEMBLY IF GAP EXCEEDS 0.002 INCH AND BEARING IS CRACKED.**

bd. If bearing is cracked and gap is within limits do this:

(1) Inspect spherical bearing for radial play using dial indicator. **RADIAL PLAY SHALL NOT EXCEED 0.020 INCH.**

(2) Inspect spherical bearing for squeeze-out of Teflon liner. **NO SQUEEZE-OUT ALLOWED.** Replace link assembly if squeeze-out is present.

be. Do an expandable pin torque check as follows:

(1) Remove cotter pin. Insert 1/4-inch socket key in center of pin.

(2) **HOLD SOCKET KEY AND PROOF TORQUE NUT TO 300 INCH-POUNDS.** Do not allow expandable pin to turn. Replace link if nut moves under 300 inch-pounds.

(3) Remove socket key. Install cotter pin, MS24665-376.

bf. Insert 1/4-inch Allen wrench into center of pin of expandable pin holding servo control rods. While holding Allan wrench, remove nut. Do not allow pin to turn (Detail E).

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

NOTE

Reinstall expandable pins in swashplate. Use only enough torque to hold pin.

bg. Inspect lateral bellcrank for axial play. **MAXIMUM AXIAL PLAY BETWEEN LATERAL BELLCRANK AND LATERAL LINK IS 0.020 INCH.**

bh. Inspect lateral bellcrank for radial play using dial indicator. **A MAXIMUM OF 0.020 INCH ALLOWABLE AT ANY ONE BEARING. TOTAL RADIAL PLAY FOR ALL BEARINGS NOT TO EXCEED 0.040 INCH.**

REMOVE LINKS

bi. Unbolt lateral link from bellcrank. Remove link. Remove spacer.

bj. On forward and aft link, remove nut, washers, and special washer. Remove bolt and link from bellcrank.

CAUTION

- The forward and aft links look almost the same. To prevent damage to flight controls, be sure forward link is part No. 70400-08110-047, 70400-08110-053, 70400-08110-060 and aft link is part No. 70400-08110-048, 70400-08110-054, or 70400-08110-061.
- Install lateral link so spacer is installed from outboard side. Spacer should contact bolthead.

INSTALL LINKS

bk. Install replacement lateral link on lateral bellcrank. Install spacer in lateral link and bellcrank.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of special self-retaining bolts are critical characteristics.

CAUTION

Damage to equipment will result if contact between bolthead and left tie rod occurs. Do not add washers under bolthead.

NOTE

Add washers under nut, as necessary, to be sure nut bottoms on link and not on bolt.

bl. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

bm. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

bn. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

NOTE

If unable to torque bolthead, use a crowfoot attachment to torque nut, without disturbing cotter pin, and without restraining bolthead.

bo. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

bp. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

11-27.8 CONTROL RODS/LINKS - PRIMARY SERVO TO SWASHPLATE 11-27.8

bq. Install replacement forward or aft link on forward or aft bellcrank. Install special self-retaining bolt and washer (under head). Install special washer over expanding ring in bolt. Install washers and nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

CAUTION

Damage to equipment could result if contact between bolthead and left tie rod occurs. Do not add washers under bolthead.

NOTE

- More washers may be added between special bolthole and slots in nut will line up after nut is torqued.
- Add washers under nut, as necessary, to be sure nut bottoms on link and not on bolt.

br. Back off nut of expandable pin until split bushing segments are loose on pin.

bs. Insert expandable pin through stationary swashplate and connecting line of control rod end. Make sure washer under nut is flush with inner side of swashplate.

bt. Tighten nut on expandable pin handtight.

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation and torque of nut is a critical characteristic.

CAUTION

To avoid damage to equipment, refer to PARA 1-6.3 when installing a link with cracked bearing.

bu. Insert 1/4-inch Allen wrench into center of pin. **HOLD ALLEN WRENCH AND TORQUE NUT TO 750 -1000 INCH-POUNDS.** Do not allow pin to turn.

bv. **CHECK THAT CLEARANCE UNDER WASHER IS NOT MORE THAN 0.002 INCH.** This means that bolt is locked in place.

bw. Install cotter pin, MS24665-376.

NOTE

One MS20002-9 flat washer may be added between the nut and washer so cotter pin hole in bolt and nut slots will line up after nut is torqued.

bx. Turn on electrical and hydraulic power (PARA 1-6.3).

by. Lift collective and rempve wooden blocks from between swashplate and main gear box.

bz. Do an operational check (TM 55-1520-237-T).

ca. Turn off all electrical and hydraulic power.

cb. Check area for cleanness and foreign material.

cc. Install main gear box fairings (PARA 11-27).

cd. Close main gear box pylon sliding cover.

11-27.9 PUSHROD - TAIL ROTOR SERVO TO TAIL ROTOR QUADRANT 11-27.9

a. Remove tail gear box fairing.

b. Unbolt pushrod from between tail rotor servo and quadrant.

c. Adjust replacement pushrod to exact length, hole-center to hole-center, as removed rod, or adjust replacement rod so rod length between self-retaining bolthole centers is 12.56 - 12.68 inches. **TIGHTEN JAMNUT 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

d. Put replacement rod between tail rotor servo arm and quadrant with adjustable rod end at servo.

e. Install self-retaining bolt and washers (under head) (PARA 11-1).

f. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

g. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

h. At servo input arm, install long bushing in rod end and slot of servo arm. Install 1-7/16-inch-long bolt, washer, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-153.

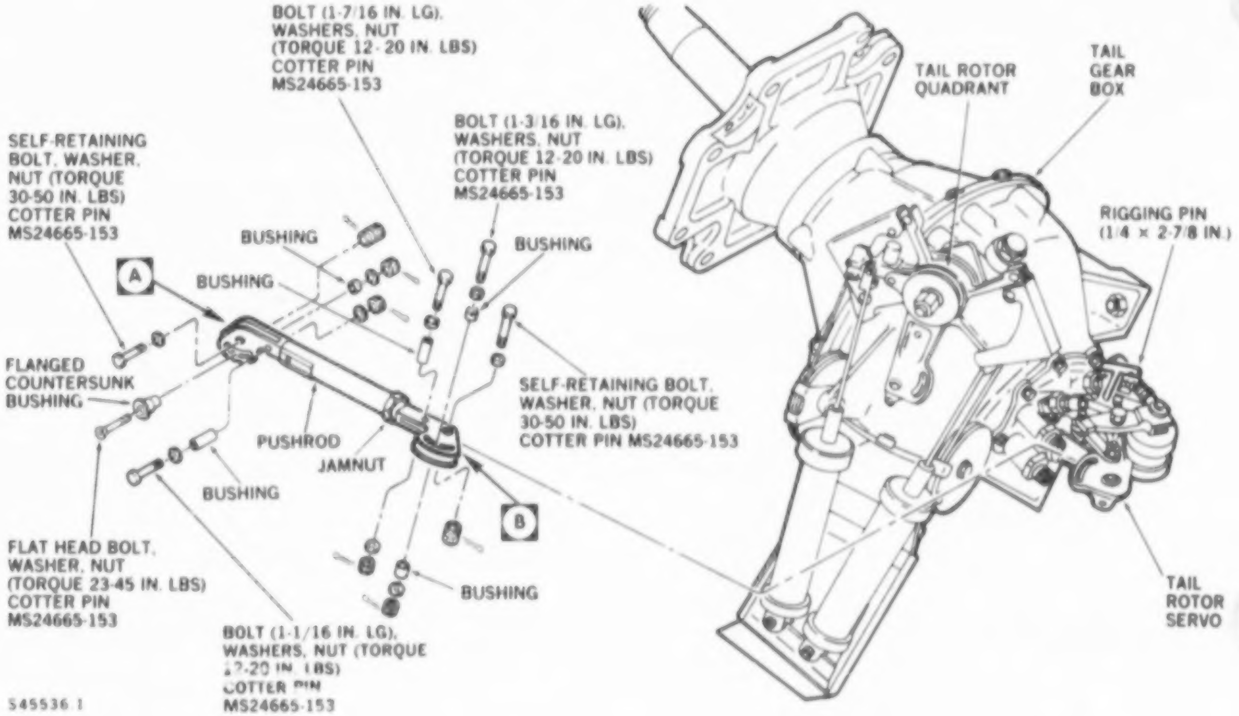

BOLT (1-7/16 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BOLT (1-3/16 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-153
BUSHING
BUSHING
BUSHING
A
FLANGED COUNTERSUNK BUSHING
PUSHROD
JAMNUT
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BUSHING
B
FLAT HEAD BOLT, WASHER, NUT (TORQUE 23-45 IN. LBS) COTTER PIN MS24665-153
BUSHING
BOLT (1-1/16 IN. LG), WASHERS, NUT (TORQUE 12-20 IN. LBS) COTTER PIN MS24665-153
TAIL ROTOR QUADRANT
TAIL GEAR BOX
RIGGING PIN (1/4 × 2-7/8 IN.)
TAIL ROTOR SERVO
545536.1

FIGURE 11-114 (SHEET 1 OF 2)

11-27.9 PUSHROD - TAIL ROTOR SERVO TO TAIL ROTOR QUADRANT 11-27.9

i. At servo end, install a short bushing in slot, each side of rod end. Install 1-3/16-inch-long bolt, washers, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-153.

j. At quadrant arm, install long bushing in rod end and slot of quadrant arm. Install 1-1/16-inch-long bolt, washers, and nut. **TORQUE NUT TO 12 - 20 INCH-POUNDS.** Install cotter pin, MS24665-153.

k. At quadrant arm, install flanged countersunk bushing in top slot of rod end (Figure 11-114, Detail A). Install plain bushing in bottom slot of rod end. Install flathead bolt in bushings and quadrant arm. Install washer and nut. **TORQUE NUT TO 23 - 45 INCH-POUNDS.** Install cotter pin, MS24665-153.

l. Check assembly for correct tri-pivot bolt installation (PARA 11-1).

m. Check tail rotor rig (PARA 11-2).

n. Check area for cleanness and foreign material.

o. Install tail gear box fairing.

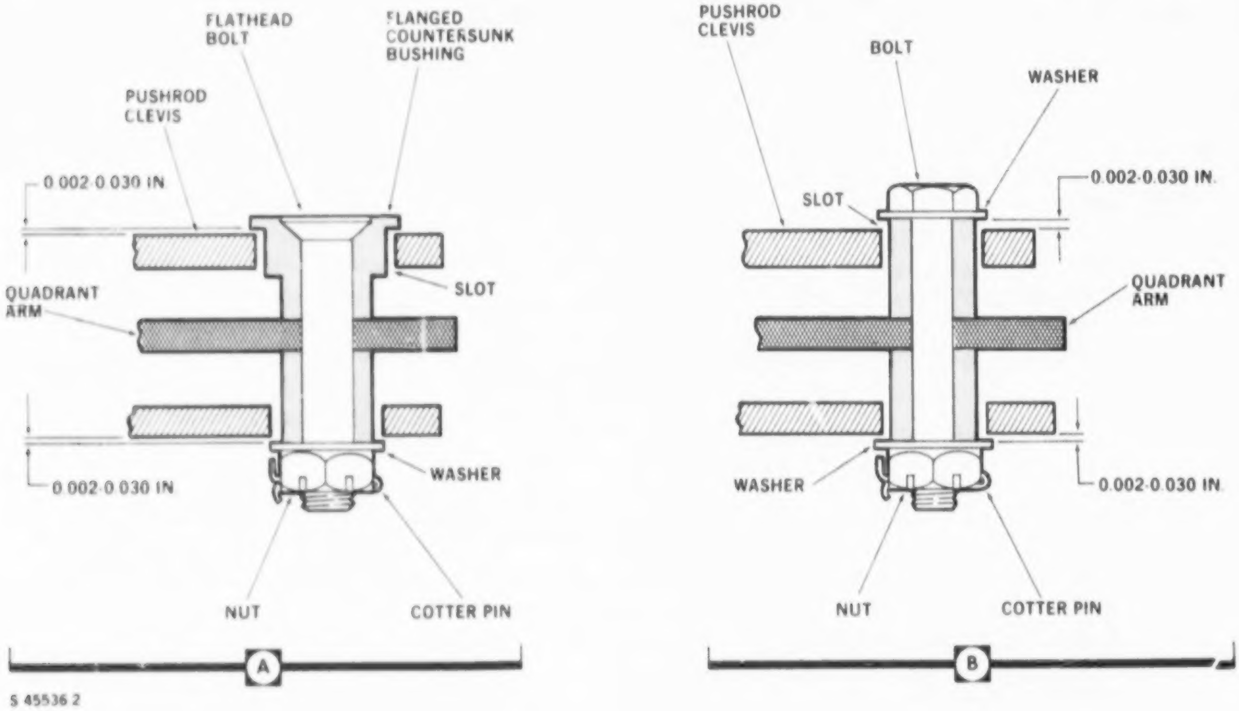

FLATHEAD BOLT
FLANGED COUNTERSUNK BUSHING
PUSHROD CLEVIS
0.002-0.030 IN
SLOT
QUADRANT ARM
WASHER
0.002-0.030 IN
NUT
COTTER PIN
A
S 45536 2
PUSHROD CLEVIS
BOLT
WASHER
0.002-0.030 IN.
SLOT
QUADRANT ARM
WASHER
0.002-0.030 IN.
NUT
COTTER PIN
B

FIGURE 11-114 (SHEET 2 OF 2)

11-27.10 REPLACE BELLCRANKS AND LEVERS IN COCKPIT 11-27.10

REMOVE

a. Remove control rods, as necessary, from bellcrank or lever to be replaced (PARA 11-27.2).

b. At copilot's cyclic stick, unbolt lateral bellcrank and yaw lever from air frame supports. Unbolt forward and aft lever from support and cyclic stick push-pull rod.

c. At pilot's cyclic stick, unbolt yaw lever and lateral bellcrank from airframe supports. Unbolt forward and aft link from bellcranks. Unbolt outboard forward and aft bellcrank from support. Unbolt forward and aft bellcrank from support and cyclic stick push-pull rod.

NOTE

The length of each arm and measurement from pivot hole to control rod attaching point is not the same on the bellcranks or on the levers. Be sure each one is positioned as shown and as instructed in the steps following, so flight controls rigging will not be changed.

INSPECT

d. Inspect bearings, MKSP4A-A1173 and MDW4K-A1173, in lateral bellcrank, 70400-01210-041, and bearings, MKSP4A-5A2922 and MDW4K-A1173 in bellcrank, 70400-01210-042, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARINGS MDW4K-A1173 OR MDW4K-400 IS 0.005-INCH. MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARINGS, MKSP4A-A1173, MKSP4A-400, AND MKSP4A-5A2922, IS 0.0025-INCH.**

e. Inspect bearings, MKSP4A-A1173, MKSP4A-5A2922, and MDW4K-A1173, in yaw lever using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING MDW4K-A1173 IS 0.005-INCH. MAXIMUM ALLOWABLE PLAY IN BEARINGS, MKSP4A-A1173, AND MKSP4A-5A2922, IS 0.0025-INCH.**

f. Inspect bearings in pilot's forward and aft bellcranks, 70400-01212-042, -043, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005-INCH.**

g. Inspect copilot's forward and aft bellcrank using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN ALL BEARINGS IS 0.005-INCH.**

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

h. At pilot's cyclic stick, install forward and aft bellcrank between cyclic stick push-pull rod and support. Bellcrank long arm between support and rod.

i. Install self-retaining bolt and washers (under head) (PARA 11-1).

j. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

k. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-27.10 REPLACE BELLCRANKS AND LEVERS IN COCKPIT 11-27.10

l. Install outboard forward and aft bellcrank in support with long arm outboard and curved down.

m. Install self-retaining bolt and washers (under head) (PARA 11-1).

n. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

o. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

p. Install forward and aft link between forward and aft bellcranks.

q. Install self-retaining bolt and washers (under head) (PARA 11-1).

r. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

s. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

t. Install lateral bellcrank in lower support on airframe with long arm outboard.

u. Install self-retaining bolt and washers (under head) (PARA 11-1).

v. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153 (Figure 11-114, Detail A).

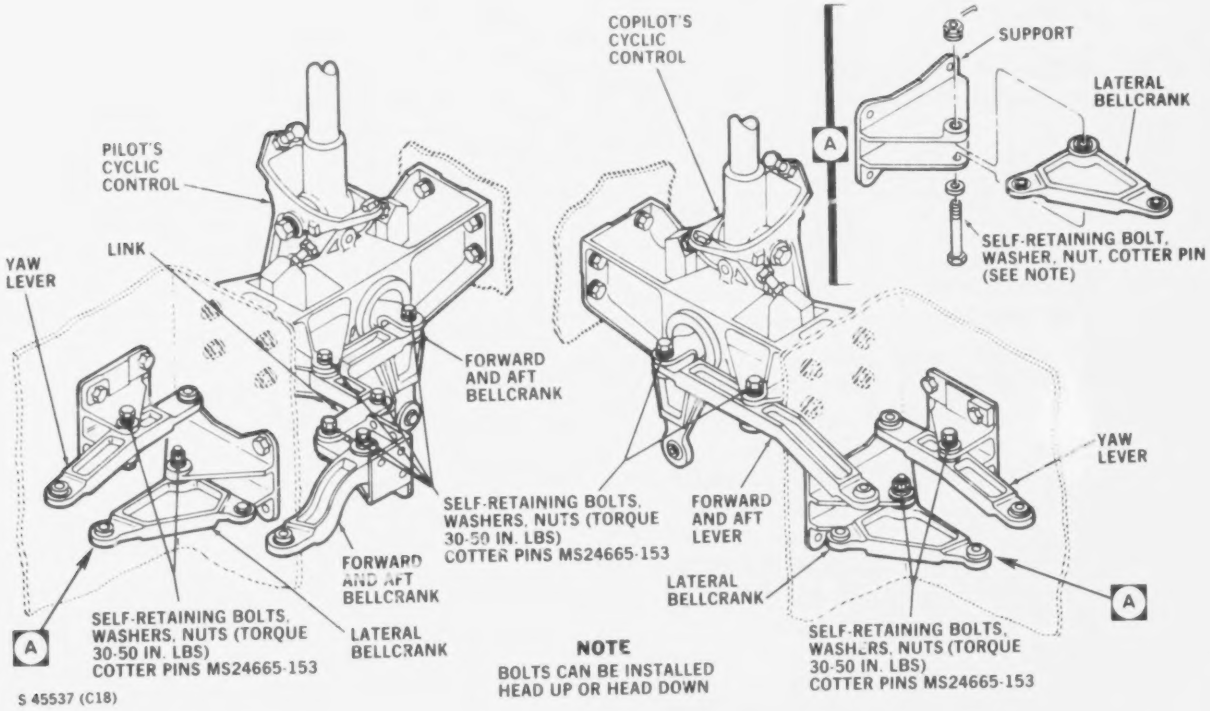

COPILOT'S CYCLIC CONTROL
SUPPORT
LATERAL BELLCRANK
A
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN (SEE NOTE)
PILOT'S CYCLIC CONTROL
LINK
YAW LEVER
FORWARD AND AFT BELLCRANK
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
FORWARD AND AFT LEVER
YAW LEVER
FORWARD AND AFT BELLCRANK
LATERAL BELLCRANK
A
A
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
LATERAL BELLCRANK
NOTE
BOLTS CAN BE INSTALLED HEAD UP OR HEAD DOWN
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 30-50 IN. LBS) COTTER PINS MS24665-153
S 45537 (C18)

FIGURE 11-115

11-27.10 REPLACE BELLCRANKS AND LEVERS IN COCKPIT 11-27.10

w. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

x. Install yaw lever in upper support on airframe with long arm outboard.

y. Install self-retaining bolt and washers (under head) (PARA 11-1).

z. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

aa. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ab. At copilot's cyclic stick, install front and rear lever between cyclic stick push-pull rod and support with long arm outboard and curved down.

ac. Install self-retaining bolt and washers (under head) (PARA 11-1).

ad. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ae. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

af. Install lateral bellcrank in lower airframe support with long arm outboard.

ag. Install self-retaining bolt and washers (under head) (PARA 11-1).

ah. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153 (Figure 11-114, Detail A).

ai. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

aj. Install yaw lever in upper airframe support with long arm outboard.

ak. Install self-retaining bolt and washers (under head) (PARA 11-1).

al. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

am. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

an. Install control rods (PARA 11-27.2). Do not install floor panels or boots now.

ao. Turn on hydraulic and electrical power (PARA 1-6.3).

ap. Install rigging pins in pedal adjustor, cyclic stick, and torque shafts (PARA 11-27.1).

NOTE

If rigging pins cannot be installed, check that replaced bellcrank or lever is installed correctly. There should be no need to adjust any control rod if bellcrank or lever is installed correctly.

aq. Remove rigging pins.

ar. Turn off all electrical and hydraulic power.

as. Check area for cleanness and foreign material.

at. Install floor panels and boots (PARA 11-27.2).

11-27.11 BELLCRANKS IN CABIN 11-27.11

REMOVE

a. Remove soundproofing panels, as necessary, covering flight controls left or right side of cabin (PARA 2-32).

b. Remove control rods as necessary from bellcranks (PARAS 11-27.2 and 11-27.3).

c. At left support unbolt lateral, pitch, and yaw bellcranks. Unbolt copilot's collective bellcrank from bulkhead support.

NOTE

To aid in assembly, loosely bolt forward support shims to same side of support they were installed on.

d. Unbolt front support and rear support, from right support and structure. Remove shims (Figure 11-116, Sheet 2, Detail A).

e. Unbolt right collective bellcrank from between front and rear supports.

f. At right support, unbolt lateral, longitudinal, and yaw bellcranks. Unbolt pilot's collective bellcrank from support on bulkhead behind pilot's collective stick (Figure 11-116, Sheet 1).

g. If necessary, unbolt bellcrank support from bulkhead.

NOTE

The length of each arm, and measurement from pivot hole to control rod attaching point is not the same on each bellcrank. Be sure each one is positioned as shown and as instructed in steps following, so flight controls rigging will not be changed.

INSPECT

h. Inspect bearings, MDW4-A1173 or MDW4-400, MKSP4A-A1173 or MKSP4A-400, and MKSP4A-SA2922 in yaw and lateral bellcranks using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARINGS, MDW4-A1173 OR MDW4-400, IS 0.005 INCH. MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARINGS, MKSP4A-A1173, MKSP4A-400 AND MKSP4A-SA2922, IS 0.0025 INCH.**

i. Inspect bearings, MKSP4A-A1173 or MKSPA-400, and MDW4K-A1173, in longitudinal bellcrank, 70400-02503-041, -042, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, MKSP4A-A1173, OR MKSPA-400, IS 0.0025 INCH. MAXIMUM ALLOWABLE RADIAL PLAY FOR BEARING, MDW4K-A1173, IS 0.005 INCH.**

j. Inspect bearings, MKSP4A-5A2922 and MDW4K-A1173, in longitudinal bellcrank, 70400-02503-043, -044, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, MKSP4A-5A2922, IS 0.0025 INCH. MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, MDW4K-A1173, IS 0.005 INCH.**

k. Inspect bearings, MKSP4A-A1173 and MKP4A-A1173, in right collective bellcrank, 70400-02504-042, and bearings, MKSP4A-5A2922 and MKP4A-A1173, in right collective bellcrank, 70400-02504-043, using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IN BEARINGS, MKSP4A-A1173 AND MKSP4A-5A2922, IS 0.0025 INCH. MAXIMUM ALLOWABLE RADIAL PLAY IN BEARING, MKP4A-A1173, IS 0.005 INCH.**

l. Inspect bearing, MDW4K-A1173, in copilot's collective bellcrank using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005 INCH.**

11-27.11 BELLCRANKS IN CABIN

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

m. Install bellcrank support on bulkhead with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

n. Install pilot's collective bellcrank in support, on bulkhead behind pilot's collective stick, with long arm down.

o. Install self-retaining bolt and washers (under head) (PARA 11-1).

p. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

q. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

r. Install yaw bellcrank in rear end of right support with long arm down and short arm toward front.

s. Install self-retaining bolt (head inboard), and washers (under head) (PARA 11-1).

t. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

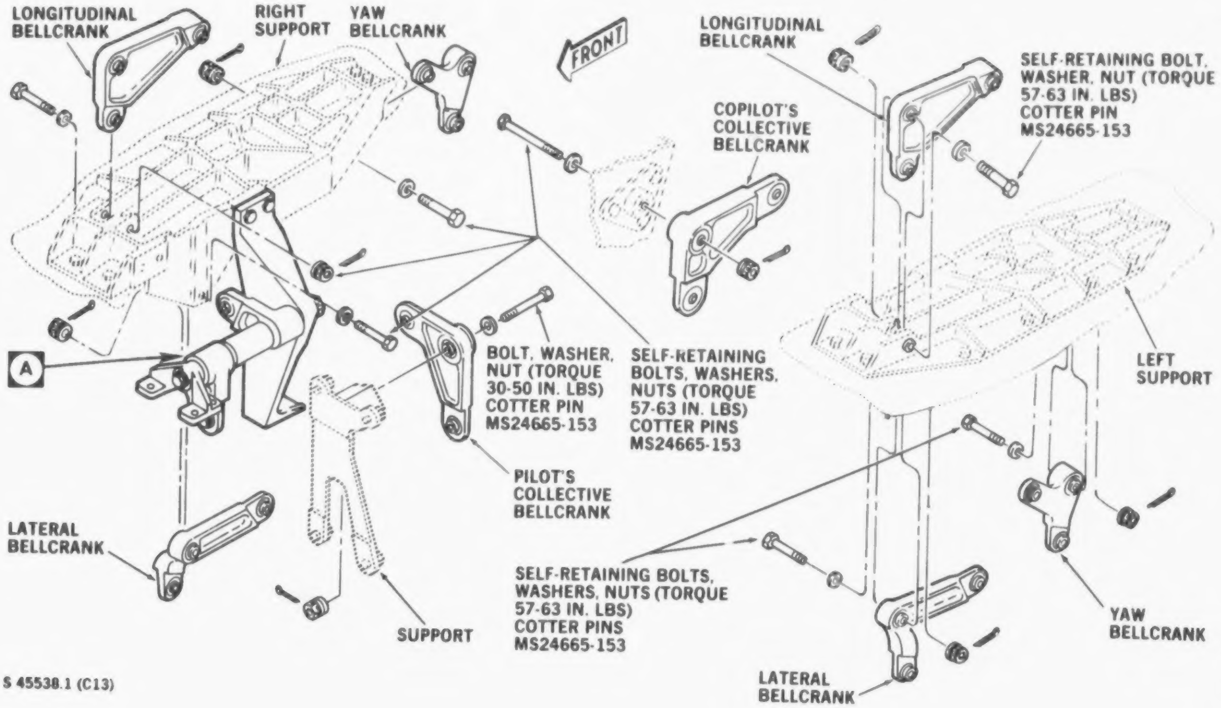

LONGITUDINAL BELLCRANK
RIGHT SUPPORT
YAW BELLCRANK
FRONT
LONGITUDINAL BELLCRANK
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 57-63 IN. LBS) COTTER PIN MS24665-153
COPILOT'S COLLECTIVE BELLCRANK
A
BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 57-63 IN. LBS) COTTER PINS MS24665-153
LEFT SUPPORT
PILOT'S COLLECTIVE BELLCRANK
LATERAL BELLCRANK
SUPPORT
SELF-RETAINING BOLTS, WASHERS, NUTS (TORQUE 57-63 IN. LBS) COTTER PINS MS24665-153
YAW BELLCRANK
LATERAL BELLCRANK
S 45538.1 (C13)

FIGURE 11-116 (SHEET 1 OF 2)

u. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

v. Install longitudinal bellcrank in right support with long arm toward rear.

w. Install self-retaining bolt (head outboard), and washers (under head) (PARA 11-1).

x. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

y. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

z. Install lateral control bellcrank in right support with long arm toward rear.

aa Install self-retaining bolt (head inboard), and washers (under head) (PARA 11-1).

ab. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ac. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ad. Install collective bellcrank between front and rear supports with arm that is oblique closest to front of helicopter (Figure 11-116, Sheet 2, Detail A).

NOTE

Bellcrank attaching bolthole is not in center between ends of front support. The end farthest from bellcrank attaching bolthole faces outboard.

ae. With bolthead at front support, install long self-retaining bolt, washer (under head) and nut. Tighten nut only enough to stop endplay. Do not install cotter pin now.

af. Install assembly against right support and on structure. Install upper and lower side bolts, washers, and nuts in rear support. Do not torque now.

ag. Check that forward support holes line up with holes in structure. If not, forward support will have to be turned around.

ah. Install shim under aft support and install bolt and washer. Do not torque now.

ai. Install shims under front support in same place they were removed from. Install bolts, washers, and nuts. Do not torque now.

aj. **TORQUE REAR SUPPORT LOWER BOLTS TO 48 - 52 INCH-POUNDS.**

ak. Check that upper and lower side bolts can be turned freely. If they cannot be turned freely, adjust thickness of shim under support so side bolts can turn freely when lower bolt is fully torqued.

al. **TORQUE REAR SUPPORT NUTS TO 57 - 63 INCH-POUNDS.**

am. **TORQUE FORWARD SUPPORT NUTS TO 43 - 47 INCH-POUNDS.**

an. Check that self-retaining bolt can move in and out without binding and that bellcrank swings freely. If not, adjust shims under forward support to line up bellcrank attaching boltholes in aft support and forward support.

ao. Install self-retaining bolt and washers (unde head) (PARA 11-1).

ap. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

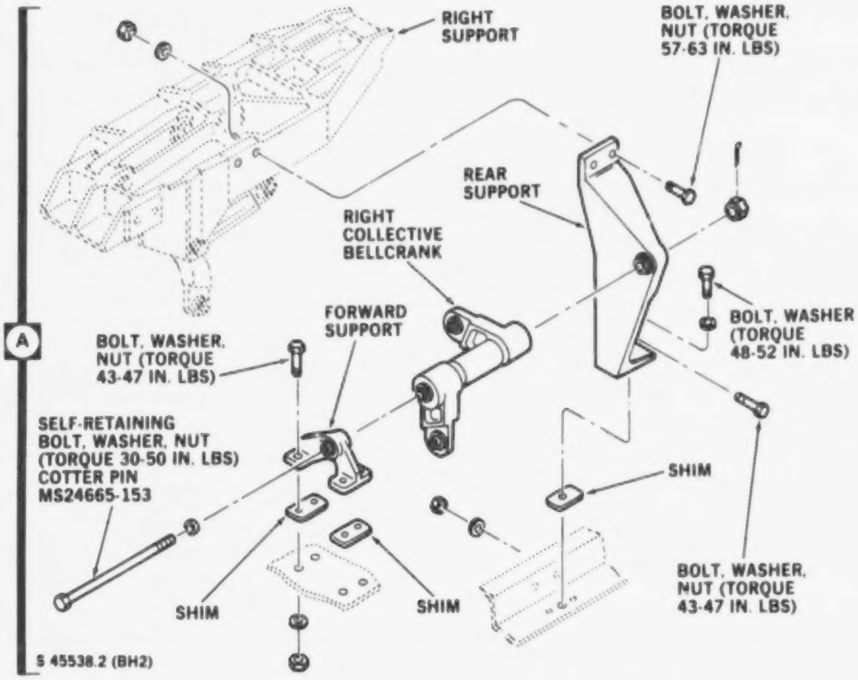

RIGHT SUPPORT
BOLT, WASHER, NUT (TORQUE 57-63 IN. LBS)
REAR SUPPORT
RIGHT COLLECTIVE BELLCRANK
FORWARD SUPPORT
BOLT, WASHER (TORQUE 48-52 IN. LBS)
A
BOLT, WASHER, NUT (TORQUE 43-47 IN. LBS)
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
SHIM
SHIM
SHIM
BOLT, WASHER, NUT (TORQUE 43-47 IN. LBS)
S 45538.2 (BH2)

FIGURE 11-116 (SHEET 2 OF 2)

aq. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

ar. Install copilot's collective bellcrank in support on bulkhead behind copilot, with long arm toward rear.

as. Install self-retaining bolt (head inboard), and washers (under head) (PARA 11-1).

at. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

au. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

av. Install yaw bellcrank in rear end of left support, with long arm down and short arm toward front.

aw. Install self-retaining bolt (head inboard), and washers (under head) (PARA 11-1).

ax. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

ay. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

az. Install longitudinal bellcrank in left support, with long arm toward rear.

ba. Install self-retaining bolt (head outboard), and washers (under head) (PARA 11-1).

bb. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

bc. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bd. Install lateral bellcrank in left support, with long arm toward rear.

be. Install self-retaining bolt (head inboard), and washers (under head) (PARA 11-1).

bf. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

bg. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

bh. Connect control rods to bellcranks (PARAS 11-27.2 and 11-27.3).

bi. Open main pylon sliding cover.

bj. Turn on hydraulic and electrical power (PARA 1-6.3).

bk. Place collective stick in low pitch.

bl. Install rigging pins in cyclic sticks, pedal adjustors, and overhead torque shafts (PARA 11-27.1).

NOTE

If rigging pins cannot be installed, check that bellcrank has been installed correctly. There should be no need to adjust any control rod if bellcrank has been installed correctly.

bm. Remove rigging pins.

bn. Turn off all electrical and hydraulic power.

bo. Check area for cleanness and foreign material.

bp. Install floor panels and soundproofing panels as necessary (PARA 2-32).

bq. Close main pylon sliding cover.

11-27.12 REPLACE LINKS AND LEVERS UPPER CABIN 11-27.12

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

REMOVE

a. Remove soundproofing panels from overhead cabin (PARA 2-32).

b. Disconnect control rods from pitch and lateral levers (PARA 11-27.3).

NOTE

Support control rods from overhead supports with tiedown straps or equivalent, unless they are removed completely.

c. Unbolt pitch link from pitch torque shaft and pitch lever.

d. Unbolt pitch lever from between supports. Remove bushings.

e. Unbolt lateral link from lateral torque shaft and lateral lever.

f. Unbolt lateral lever from between supports. Remove bushings.

INSTALL

g. Install replacement lateral lever between overhead supports. Line up holes.

NOTE

Boltheads at lever face front.

h. Install self-retaining bolt (head front), and washers (under head) (PARA 11-1).

i. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

j. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

k. Install bushings through rear side of support and through slots in lateral lever. Install bolts (head front), washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

l. Put lateral link between lateral lever and lateral torque shaft.

m. Install self-retaining bolt and washers (under head) (PARA 11-1).

n. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

o. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

p. At each end of link, install long bushing through link and slots in levers. Install bolts, washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pins, MS24665-153.

q. Install short bushings in slots on each side of link ends. Install bolts, washers, and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

r. Install pitch lever between supports. Line up boltholes.

11-27.12 REPLACE LINKS AND LEVERS UPPER CABIN 11-27.12

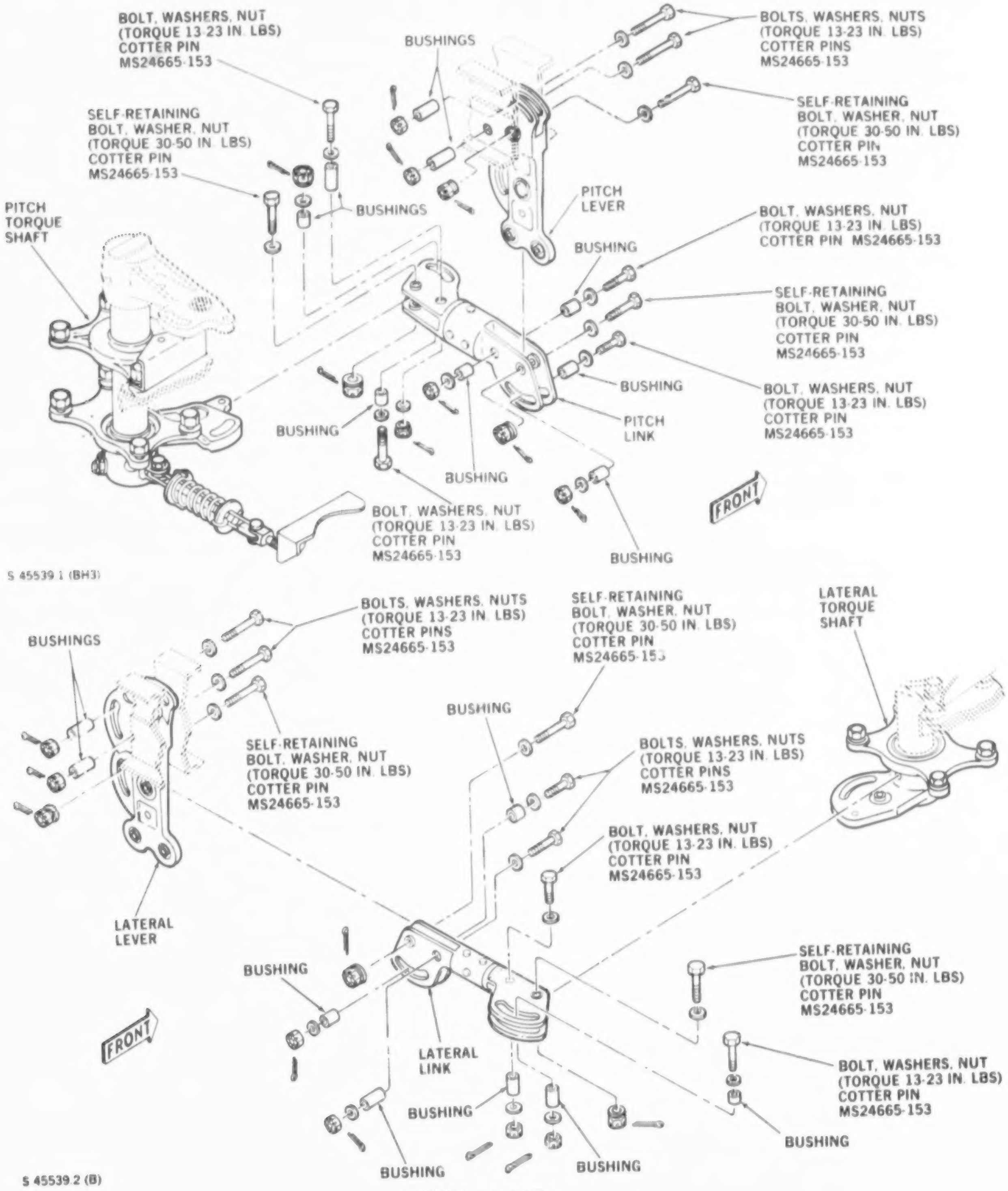

BOLT, WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-153
BUSHINGS
BOLTS, WASHERS, NUTS
(TORQUE 13-23 IN. LBS)
COTTER PINS
MS24665-153
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
PITCH
TORQUE
SHAFT
BUSHINGS
PITCH
LEVER
BOLT, WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN MS24665-153
BUSHING
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
BUSHING
BOLT, WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-153
PITCH
LINK
BUSHING
BUSHING
FRONT
BOLT, WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-153
BUSHING
S 45539.1 (BH3)
BOLTS, WASHERS, NUTS
(TORQUE 13-23 IN. LBS)
COTTER PINS
MS24665-153
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
LATERAL
TORQUE
SHAFT
BUSHINGS
BUSHING
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
BOLTS, WASHERS, NUTS
(TORQUE 13-23 IN. LBS)
COTTER PINS
MS24665-153
BOLT, WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-153
LATERAL
LEVER
BUSHING
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
FRONT
LATERAL
LINK
BOLT, WASHERS, NUT
(TORQUE 13-23 IN. LBS)
COTTER PIN
MS24665-153
BUSHING
BUSHING
BUSHING
BUSHING
S 45539.2 (B)

FIGURE 11-117

11-27.12 REPLACE LINKS AND LEVERS UPPER CABIN 11-27.12

s. Install self-retaining bolt (head front), and washers (under head) (PARA 11-1).

t. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

u. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

v. Install bushings through rear side of support and through slots in pitch lever. Install bolts (head front), washers and nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

w. Put pitch link between pitch lever and pitch torque shaft.

x. Install self-retaining bolt and washers (under head) (PARA 11-1).

y. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

z. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

NOTE

Boltheads at lever face front.

aa. At each end of link, install long bushing through link and slots in levers. Install bolts, washers, and nuts. **TORQUE NUTS TO 30 - 50 INCH-POUNDS.** Install cotter pins, MS24665-153.

ab. Install short bushing in slots, each side of link ends. Install bolts, washers, nuts. **TORQUE NUTS TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

ac. Check area for cleanness and foreign material.

ad. Inspect installed control rod for proper tri-pivot bolt installation (PARA 11-1).

ae. Install overhead soundproofing panels.

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

WARNING

FLIGHT SAFETY PARTS

All self-retaining bolts, bellcranks, tie rods, connecting links, control rods, bellcrank supports and support fitting contain critical surfaces which must not be damaged during and after removal. Use extreme caution when removing and provide protective covering after removal.

a. Open main pylon sliding cover.

b. Remove main gear box fairings to get to bridge (PARA 11-27).

c. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

d. Raise collective to raise swashplate.

e. Install wooden blocks between swashplate and main gear box, to support swashplate while removing rods and links.

CAUTION

Do not apply down collective with blocks installed.

f. Turn off all hydraulic and electrical power.

g. Remove control rods and links as necessary from bellcranks or walking beam to be replaced (PARA 11-27.8) after inspection.

INSPECT

h. Before removing walking beam, inspect spherical bearing connections for maximum radial and axial wear limits.

i. Measure radial play, using dial indicator. **MAXIMUM RADIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

j. **THE COMBINED TOTAL RADIAL PLAY READINGS, OF ALL SPHERICAL BEARING CONNECTIONS ON WALKING BEAM, SERVO, AND AFT BELLCRANK SHALL NOT EXCEED 0.040 INCH.**

k. Measure axial play, using dial indicator. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

l. Measure axial play between walking beam and bridge. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH.**

NOTE

- To remove and install special bolts, insert about a 1/8-inch-diameter Allen wrench in hole in bolthead . Push on pin to release retaining balls at nut end of bolt. Keep pressure on pin while removing and installing bolt.
- It may be necessary to tap out spacers using a nonmetallic punch. Do not reuse spacers that have been tapped out.

REMOVE WALKING BEAM

m. Unbolt walking beam from bridge support. Remove spacer. Remove walking beam.

n. After removal of walking beam, inspect pivot bushings for cracks, or evidence of corrosion. **NO CORROSION OR CRACKS ALLOWED.** Replace damaged part.

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal in a critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

o. Inspect walking beam lug area surface (PARA 11-32).

p. Inspect special self-retaining bolts grip length surface (PARA 11-32).

q. Inspect spacer along entire length, using inside micrometer. **MAXIMUM ALLOWABLE STEP ON BORE CIRCUMFERENCE SHALL NOT EXCEED 0.015 INCH.**

INSTALL WALKING BEAM

r. Install replacement walking beam in bridge support. Install spacer through support and walking beam.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of special self-retaining bolts are critical characteristics.

NOTE

Add washers under bolthead as needed, to be sure nut seats against support and does not bottom on bolt threads.

s. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

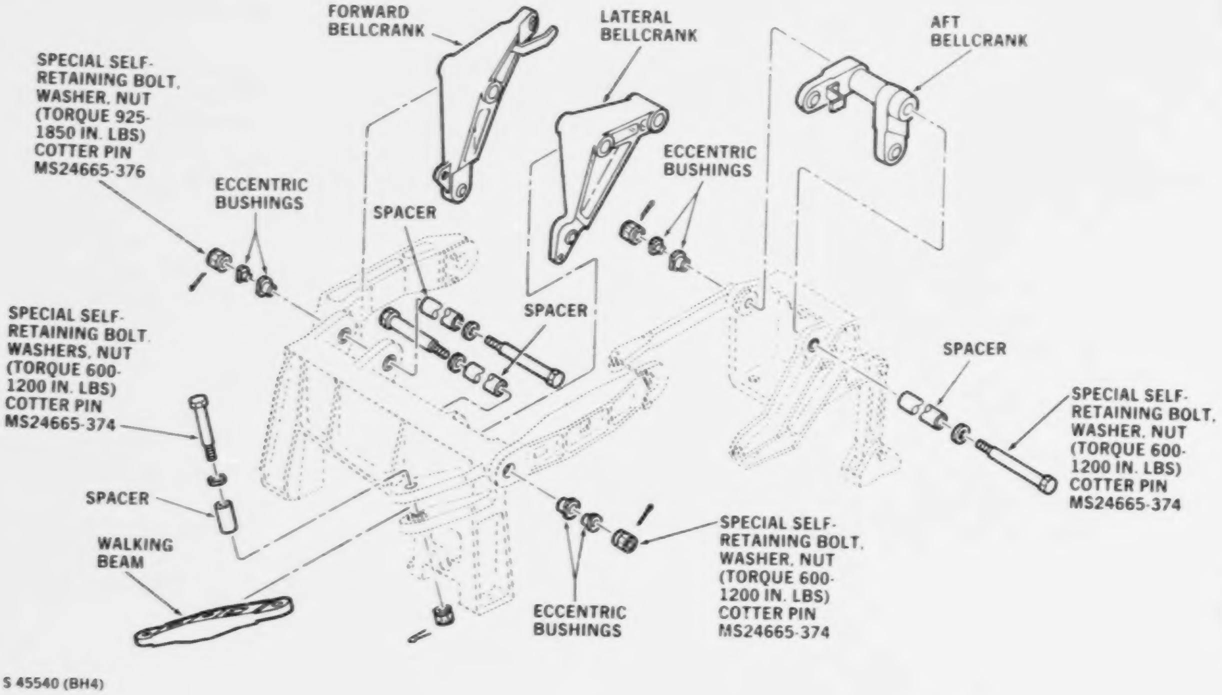

FORWARD BELLCRANK
LATERAL BELLCRANK
AFT BELLCRANK
SPECIAL SELF-RETAINING BOLT, WASHER, NUT (TORQUE 925-1850 IN. LBS) COTTER PIN MS24665-376
ECCENTRIC BUSHINGS
SPACER
ECCENTRIC BUSHINGS
SPACER
SPECIAL SELF-RETAINING BOLT, WASHERS, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
SPACER
SPECIAL SELF-RETAINING BOLT, WASHER, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
SPACER
WALKING BEAM
ECCENTRIC BUSHINGS
SPECIAL SELF-RETAINING BOLT, WASHER, NUT (TORQUE 600-1200 IN. LBS) COTTER PIN MS24665-374
S 45540 (BH4)

FIGURE 11-118

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

t. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

u. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

v. **PROOF TORQUE BOLTHEAD TO 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

INSPECT

w. Before removing lateral bellcrank, inspect spherical bearing connections for maximum radial and axial wear limits.

x. Measure radial play, using dial indicator. **MAXIMUM RADIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

v. **THE COMBINED TOTAL RADIAL PLAY, OF ALL SPHERICAL BEARING CONNECTIONS ON LATERAL BELLCRANK, AND SERVO SHALL NOT EXCEED 0.040 INCH.**

y. Measure axial play, using dial indicator. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

z. Measure axial play between lateral bellcrank and bridge. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH.**

REMOVE LATERAL BELLCRANK

aa. Unbolt lateral bellcrank from bridge. Remove spacer and remove bellcrank. If eccentric bushings come out with bolt, put them back in support.

ab. After removal of lateral bellcrank, inspect pivot bushings for cracks, or evidence of corrosion.

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal in a critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

ac. Inspect lateral bellcrank lug and rib area surfaces (PARA 11-32).

ad. Inspect special self-retaining bolts grip length surface (PARA 11-32).

ae. Inspect spacer along entire length, using inside micrometer. **MAXIMUM ALLOWABLE STEP ON BORE CIRCUMFERENCE SHALL NOT EXCEED 0.015 INCH.**

best copy available

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

INSTALL LATERAL BELLCRANK

af. Install lateral bellcrank in support with long arm (with rigging pin hole) down. Install spacer through inboard side of support.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of special self-retaining bolts are critical characteristics.

NOTE

- Turn eccentric bushings as necessary to line up boltholes.
- Add washers under bolthead as needed, to be sure nut seats against support and does not bottom on nut.

ag. Install special self-retainign bolt and washers (maximum of 3 under bolthead) through eccentric busings and bellcrank to provide correct grip length and cotter pin position.

ah. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

ai. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

INSPECT

aj. Before removing forward bellcrank, inspect spherical bearing connections for maximum radial and axial wear limits.

ak. Measure radial play, using dial indicator. **MAXIMUM RADIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

al. **THE COMBINED TOTAL RADIAL PLAY, OF ALL SPHERICAL BEARING CONNECTIONS ON FORWARD BELLCRANK, AND SERVO SHALL NOT EXCEED 0.040 INCH.**

am. Measure axial play, using dial indicator. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

an. Measure axial play between bellcrank and bridge. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH.**

REMOVE FORWARD BELLCRANK

ao. Unbolt forward bellcrank from bridge. Remove spacer and remove bellcrank. If eccentric bushings come out with bolt, put them back in support.

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal in a critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

ap. After removal of forward bellcrank, inspect pivot bushings for cracks, or evidence of corrosion. **NO CRACKS OR CORROSION ALLOWED.** Replace damaged part.

aq. Inspect forward bellcrank lug and rib surface areas (PARA 11-32).

ar. Inspect special self-retaining grip length surface (PARA 11-32).

as. Inspect spacer along entire length, using inside micrometer. **MAXIMUM ALLOWABLE STEP ON BORE CIRCUMFERENCE SHALL NOT EXCEED 0.015 INCH.**

INSTALL FORWARD BELLCRANK

at. Install replacement forward bellcrank in support with long arm (with rigging pin hole) down. Install spacer through inboard side of support.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of special self-retaining bolts are critical characteristics.

NOTE

- Turn eccentric bushings as necessary to line up boltholes.
- Add washers under bolthead as needed to be sure nut seats against support and does not bottom on bolt threads.

au. Install special self-retaining bolt and washers (maximum of 3 under bolthead) through eccentric bushings and bellcrank to provide correct grip length and cotter pin position.

av. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds and impedence feature is depressed, change washer stackup.

aw. Install nut. **TORQUE NUT TO 77 - 154 FOOT-POUNDS.** Install cotter pin, MS24665-376.

ax. **PROOF TORQUE BOLTHEAD TO 630-650 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

INSPECT

ay. Before removing aft bellcrank, inspect spherical bearing connections for maximum radial and axial wear limits.

az. Inspect aft bellcrank for corrosion. **CORROSION PITS SHALL NOT BE GREATER THAN 0.040 INCHES.**

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

ba. Measure radial play, using dial indicator. **MAXIMUM RADIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

bb. **THE COMBINED TOTAL RADIAL PLAY, OF ALL SPHERICAL BEARING CONNECTIONS ON AFT BELLCRANK, SERVO, AND WALKING BEAM SHALL NOT EXCEED 0.040 INCH.**

bc. Measure axial play, using dial indicator, MIL-I-18422. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.020 INCH PER CONNECTION.**

bd. Measure axial play between aft bellcrank and bridge. **TOTAL AXIAL PLAY SHALL NOT EXCEED 0.044 INCH.**

REMOVE AFT BELLCRANK

be. Unbolt aft bellcrank from bridge. Remove spacer and remove bellcrank.

bf. After removal of aft bellcrank, inspect pivot bushings for cracks, or evidence of corrosion. **NO CRACKS OR CORROSION ALLOWED.**

WARNING

FLIGHT SAFETY PART

Do not attempt to repair damage that penetrates into base metal in a critical characteristic area. Damage to paint or protective finishes not penetrating into base metal may be touched up. Parts with damage into base metal that are within the critical characteristic area are to be replaced. Refer to PARA 11-32 for critical characteristic areas.

bg. Inspect aft bellcrank lug area surfaces (PARA 11-32).

bh. Inspect special self-retaining bolts grip length surface (PARA 11-32).

bi. Inspect spacer along entire length, using inside micrometer. **MAXIMUM ALLOWABLE STEP ON BORE CIRCUMFERENCE SHALL NOT EXCEED 0.015 INCH.**

REPAIR

bj. Remove loose rust manually, then apply corrosion removing compound, Item 119, Appendix D.

INSTALL AFT BELLCRANK

bk. Install aft bellcrank in support with arm with retainer inboard facing forward. Install spacer through outboard side of support.

WARNING

FLIGHT SAFETY PART

Verification of proper hardware installation, torque, safety installation and proof torque of self-retaining bolts are critical characteristics.

NOTE

- Turn eccentric bushings as necessary to line up boltholes.
- Add washers under head as needed to be sure nut seats against support and does not bottom on bolt threads.

bl. Install special self-retaining bolt and washers (maximum of 3 under bolthead) to provide correct grip length and cotter pin position.

11-27.13 BELLCRANKS/WALKING BEAM -MAIN GEAR BOX BRIDGE 11-27.13

bm. Check bolt for free axial motion and that impedence feature is not restrained in part. If bolt binds or impedence feature is depressed, change washer stackup.

bn. Install nut. **TORQUE NUT TO 600 - 1200 INCH-POUNDS.** Install cotter pin, MS24665-374.

bo. **PROOF TORQUE BOLTHEAD to 400 - 420 INCH-POUNDS.** If bolt rotates, adjust using washers. Apply slippage mark.

bp. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

bq. Raise collective and remove wooden blocks from between swashplate and main gear box.

br. Turn off all hydraulic and electrical power.

bs. Check area for cleanness and foreign material.

bt. Install main gear box fairings (PARA 11-27).

bu. Close main rotor pylon sliding cover.

11-28 FLIGHT CONTROL CABLE AND PULLEYS - REPLACE 11-28

PARAGRAPH BREAKDOWN

11-28.1	INSTALL LOCKOUT BLOCKS
11-28.2	REPLACE CABIN CABLES
11-28.3	REPLACE TAIL CONE CABLES
11-28.4	REPLACE PYLON CABLES
11-28.5	REPLACE CABLE PULLEY
11-28.6	REPLACE CABLE CONDUIT

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Abrasive Cloth, Item 3, Appendix D
- Adhesive Primer, Item 52, Appendix D
- Adhesive, Item 36, Appendix D
- Cheesecloth, Item 98, Appendix D
- Cord (About 20 feet long)
- Cotter Pin, MS24665-153
- Epoxy Primer, Item 150, Appendix D
- Locking Clip, MS21256-2
- Lockwire, Item 199, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Tiedown Strap, Item 364, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Lockout Blocks, 70700-20463-041
- Nonmetallic Scraper, Locally-Made
- Rigging Kit, 70700-20389-042
- Tensiometer, MIL-T-38760
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 1-6.1
- PARA 2-32
- PARA 2-34
- PARA 2-54
- PARA 6-16
- PARA 11-1
- PARA 11-2
- PARA 11-27
- TM 11-1520-237-23-3
- TM 55-1500-204-25/1
- TM 55-1520-237-T

11-28.1 INSTALL LOCKOUT BLOCKS 11-28.1

a. Remove tail gear box front fairing.

WARNING

FLIGHT SAFETY PARTS

- Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.
- To prevent injury to personnel, lockout blocks and tiedown straps must be installed on tail rotor quadrant, or spring cylinders must be disconnected, before disconnecting tail rotor cables.
- To prevent injury to personnel make sure there is communication between person in cockpit and person at quadrant.

b. Install lockout blocks on tail rotor quadrant. Secure lockout blocks with tiedown straps, Item 364, Appendix D.

NOTE

The lockout blocks should be used for all cable and pulley replacement, except for the two pylon cables. For pylon cable replacement, use the following alternate method to restrain tail rotor quadrant spring cylinders.

(1) Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

(2) Place collective stick in about midposition.

(3) For right spring cylinder, apply full left pedal to reduce spring tension. Remove cotter pin, nut, and washer. Pull down on cylinder while removing bolt. Unbolt spring cylinder from support.

(4) For left spring cylinder, apply full right pedal to reduce spring tension. Remove cotter pin, nut, and washer. Pull down on cylinder while removing bolt. Unbolt spring cylinder from support.

(5) Turn off all electrical and hydraulic power.

c. Flight control cable tension can now be released.

d. After replacing cables and adjusting tension, lockout blocks can be removed.

NOTE

If lockout blocks are not installed and spring cylinders are disconnected from support, connect them as follows:

(1) Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

(2) Place collective stick in midposition.

WARNING

FLIGHT SAFETY PARTS

Verification of toggle installation is a critical characteristic.

(3) Be sure toggle is in notch while connecting cylinders to support, causing microswitch to be depressed.

(4) For right spring cylinder apply full left pedal. Pull on cylinder and install bolt in cylinder and support (head up).

e. Install self-retaining bolts and washers (under head) (PARA 11-1).

f. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

g. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

11-28.1 INSTALL LOCKOUT BLOCKS 11-28.1

h. For left spring cylinder apply full right pedal. Pull on cylinder and install bolt in cylinder and support (head up).

i. Install self-retaining bolts and washers (under head) (PARA 11-1).

j. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

k. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

l. Make sure tail rotor quadrant caution capsule is off.

m. Turn off all electrical and hydraulic power.

n. Check area for cleanness and foreign material.

o. Install tail gear box front fairing.

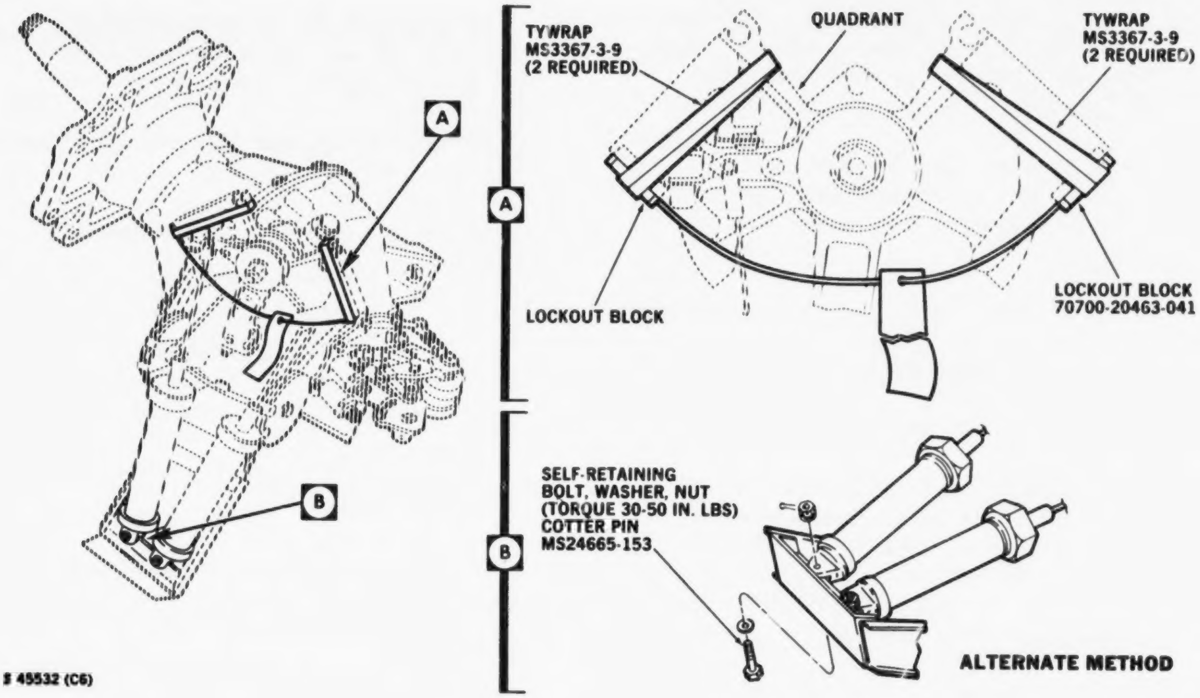

A
B
TYWRAP
MS3367-3-9
(2 REQUIRED)
QUADRANT
TYWRAP
MS3367-3-9
(2 REQUIRED)
A
LOCKOUT BLOCK
LOCKOUT BLOCK
70700-20463-041
SELF-RETAINING
BOLT, WASHER, NUT
(TORQUE 30-50 IN. LBS)
COTTER PIN
MS24665-153
B
ALTERNATE METHOD
S 45532 (C6)

FIGURE 11-119

11-28.2 REPLACE CABIN CABLES 11-28.2

REMOVE

a. Remove soundproofing from cabin ceiling, station 295 to rear of cabin (PARA 2-32).

b. Unhook and remove cargo panels from fuel panel enclosure.

WARNING

Uncontrolled spring release may cause personal injury or damage to equipment. Make sure spring tension on tail rotor quadrant and cables has been removed before disconnecting cables.

c. Install tail rotor quadrant lockout blocks or disconnect spring cylinders (PARA 11-28.1).

d. Remove turnbuckle locking clips (TM 55-1500-204-25/1).

e. Unscrew turnbuckle body to remove cable terminal end.

f. Remove cable guard pins and guard bracket (Figure 11-120, Detail B) from pulleys (-3), (-4), (-5), (-6), and quadrant (Figure 11-120). To reach pulley (-3) it may be necessary to remove stabilator amplifier (TM 11-1520-237-23-3).

g. Remove torque shaft lever to forward quadrant control rod (PARA 11-27).

h. Remove bolts, washers, nuts, and pulleys (-1) and (-2).

i. Remove cable guard pins and guard bracket from pulleys (-7), (-8), (-9) and (-10).

j. Pull cable toward front of helicopter. Guide terminal end of cable through pulley brackets.

k. Remove forward quadrant cable retaining cotter pins, if installed.

l. Disconnect cable from quadrant. Remove collars from cables.

INSPECT

m. Inspect cable plastic coatings for wear. **REPLACE CABLE IF PLASTIC COATING IS WORN THROUGH TO EXPOSE BARE CABLE.**

n. Inspect plastic grommets at stations 311, 379, 392 and 433. Replace worn through grommets.

o. Inspect cable guard pins for wear. Replace bent or notched guard pins.

INSTALL

WARNING

FLIGHT SAFETY PARTS

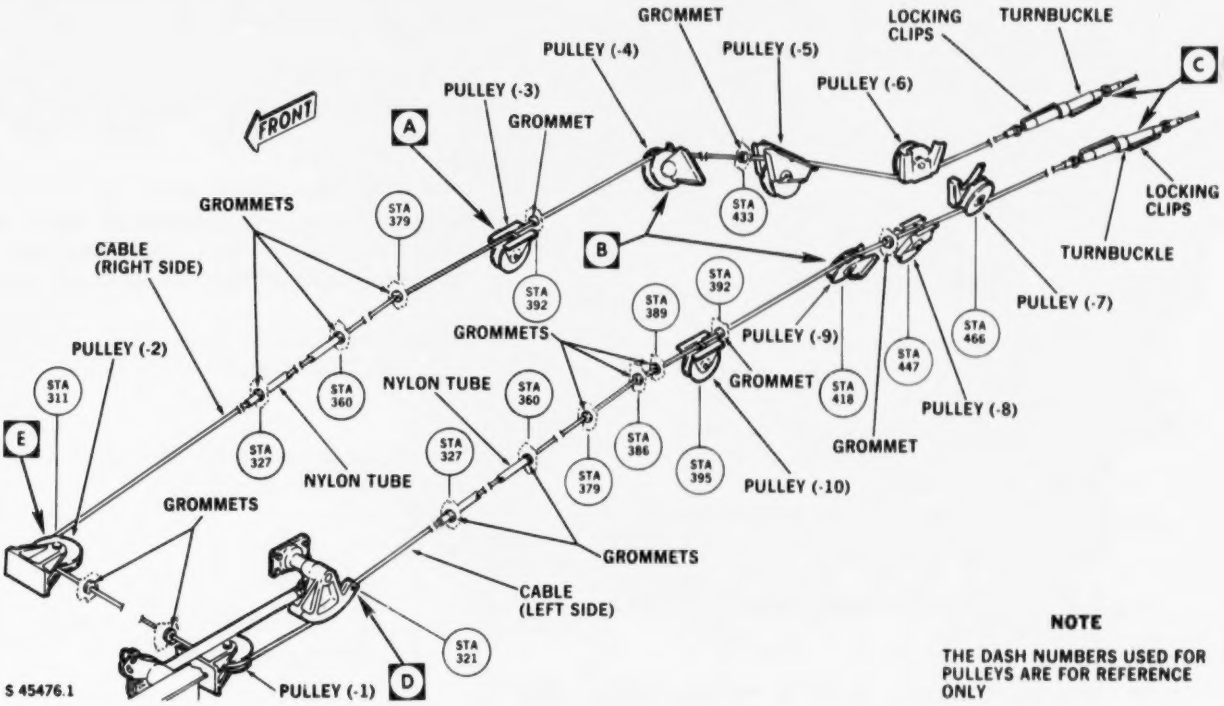
- Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.
- Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

p. Install right side cable. Start from the rear (-6) pulley and work forward. Lead with the cable ball-end as follows:

(1) Thread cable under (-6) pulley. Install cable guard pin (Figure 11-120, Sheet 1).

(2) Thread cable over top of (-5) pulley. Install cable guard pin.

11-28.2 REPLACE CABIN CABLES 11-28.2


GROMMET
LOCKING CLIPS
TURNBUCKLE
PULLEY (-4)
PULLEY (-5)
C
PULLEY (-3)
PULLEY (-6)
FRONT
A
GROMMET
LOCKING CLIPS
GROMMETS
STA 379
STA 433
TURNBUCKLE
CABLE (RIGHT SIDE)
B
STA 392
STA 392
PULLEY (-7)
STA 389
GROMMETS
STA 466
PULLEY (-9)
PULLEY (-2)
STA 447
GROMMET
STA 311
STA 360
NYLON TUBE
STA 360
STA 418
PULLEY (-8)
E
STA 327
STA 327
STA 386
GROMMET
NYLON TUBE
STA 379
STA 395
PULLEY (-10)
GROMMETS
GROMMETS
CABLE (LEFT SIDE)
STA 321
S 45476.1
PULLEY (-1)
D

NOTE

THE DASH NUMBERS USED FOR PULLEYS ARE FOR REFERENCE ONLY

FIGURE 11-120 (SHEET 1 OF 2)

(3) Pass cable through station 433 grommet, then over top of pulley (-4). Install cable guard with bolts and washers. **TORQUE BOLTS TO 48 - 52 INCH POUNDS** (Figure 11-120) Sheet 2, Detail B).

(4) Pass cable through station 398 grommet then over top of (-3) pulley. Install cable guard pin.

(5) Install guard pins in pulley brackets (-1) and (-2). Install pulleys (-1) and (-2) with cable in pulley grooves.

q. Install self-retaining bolt and washers (under head) (PARA 11-1).

r. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153 (Figure 11-120, Sheet 2, Detail E).

s. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

t. Install collar on cable ball-end with ball nested inside collar (Figure 11-120, Sheet 2, Detail F).

u. Slip cable assembly into quadrant outboard keyhole slot. Guide cable into outboard groove.

v. Install left side cable. Start from the rear (-7) pulley and work forward. Lead with the cable ball-end as follows:

(1) Thread cable under (-7) pulley. Install cable guard pin (Figure 11-120, Sheet 1).

(2) Thread cable over top of (-8) pulley, then through station 433 grommet. Install cable guard with bolts and washers. **TORQUE BOLTS TO 48 - 52 INCH-POUNDS** (Figure 11-120, Sheet 2, Detail B).

(3) Guide cable over top of (-10) pulley. Install guard pin.

(4) Guide cable forward through grommets at stations 389, 386, 379, and nylon conduit to front of quadrant.

(5) Install collar on cable ball-end with ball nested inside collar (Figure 11-120, Sheet 2, Detail F).

(6) Slip cable assembly into quadrant keyhole slot. Guide cable into inboard groove.

(7) Install quadrant cable guard pin with washers and cotter pins, MS24665-153 (Figure 11-120, Sheet 2, Detail D).

w. Use an inspection mirror and flashlight where required to see that cable is kept in pulley groove by the cable guards or pins at each pulley installation.

x. Install torque shaft lever to forward quadrant lever control rod (PARA 11-27).

y. Connect cabin cables to tail cone cables with turnbuckle barrels. Make sure terminal ends are threaded equally into turnbuckle.

z. Remove lockout blocks or connect tail rotor quadrant spring cylinders (PARA 11-28.1).

aa. Open main rotor pylon cover.

ab. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	**Operating Time (Minutes)**	**Cool-down Time, Pump Off (Minutes)**
90° (32°) max	Unlimited	-
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

ac. Install rigging pin in collective and yaw boost servo.

ad. Install rigging pin in left side of mixer, then install rigging pin in tail rotor servo.

CAUTION

To prevent damage while tensioning cables, constantly check rigging pins for free fit.

ae. Using tensiometer, set cable tension by turning turnbuckle barrel. Set tension per Table 11-11.

af. Check turnbuckle for safety. **NOT MORE THAN THREE THREADS OF TERMINAL MAY SHOW BEYOND END OF TURNBUCKLE.** If more than three threads are showing, check cable for proper installation.

ag. Install turnbuckle locking clips, MS21256-2 (Figure 11-120, Detail C) (TM 55-1500-204-25/1).

11-28.2 REPLACE CABIN CABLES 11-28.2

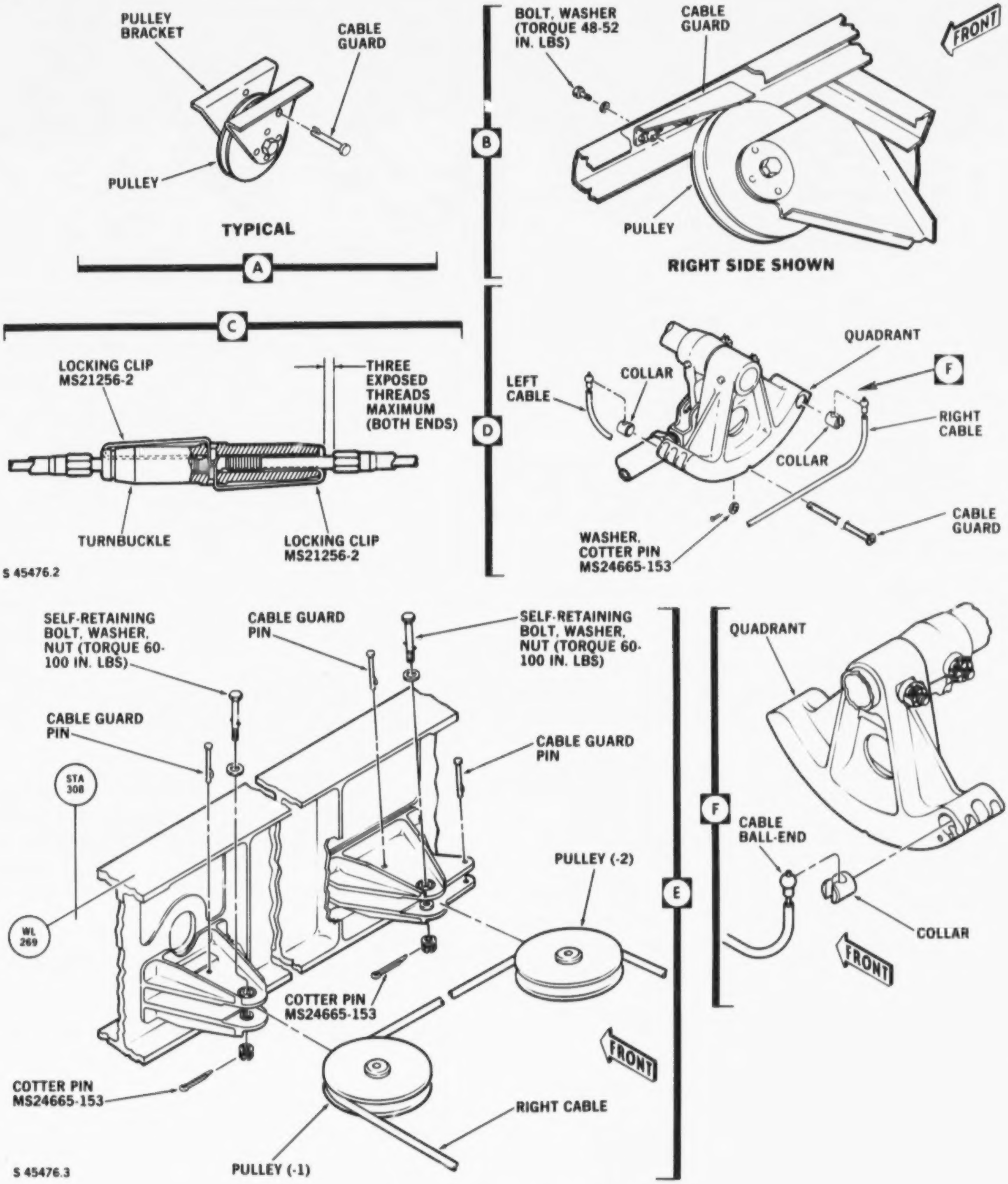

PULLEY BRACKET
CABLE GUARD
PULLEY
TYPICAL
A
BOLT, WASHER (TORQUE 48-52 IN. LBS)
CABLE GUARD
FRONT
B
PULLEY
RIGHT SIDE SHOWN
C
LOCKING CLIP MS21256-2
THREE EXPOSED THREADS MAXIMUM (BOTH ENDS)
TURNBUCKLE
LOCKING CLIP MS21256-2
S 45476.2
QUADRANT
LEFT CABLE
COLLAR
F
RIGHT CABLE
D
COLLAR
CABLE GUARD
WASHER, COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS)
CABLE GUARD PIN
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS)
CABLE GUARD PIN
CABLE GUARD PIN
STA 308
WL 269
PULLEY (-2)
E
COTTER PIN MS24665-153
FRONT
COTTER PIN MS24665-153
RIGHT CABLE
PULLEY (-1)
S 45476.3
QUADRANT
F
CABLE BALL-END
COLLAR
FRONT

FIGURE 11-120 (SHEET 2 OF 2)

11-28.2 REPLACE CABIN CABLES 11-28.2

TABLE 11-11. Tail Rotor Cable Temperature Correction Chart

Temperature Range Degrees (°F)	Temperature Range Degrees (°C)	Cable Tension (Lbs)
+5 to +24	−15.0 to −5	61 to 85
+25 to +44	−4.9 to +7	85 to 109
+45 to +64	+7.2 to +18	109 to 133
+65 to +84	+18.3 to +29	133 to 168
+85 to +104	+29.4 to +40	168 to 191
+105 to +124	+41.6 to +51	191 to 215
+125 to +144	+52.7 to +63	215 to 237
+145 to +160	+63.8 to +71	237 to 250

1. Check cable tension only after helicopter has been at an even temperature for 1 hour. Do not check tension with helicopter parked in hot sun. Tolerance on specified tension values is ±2% difference between two cables.

2. If temperatures below +5°F are anticipated, set tension to 75 pounds. Reset tension to chart before helicopter is operated at temperatures above 40°F.

3. Flight control cables are 5/32-inch diameter, and with a plastic coating the total diameter is 7/32 inch. Measure cable tension with proper tensiometer setting.

(1) When using adjustable risers, the No. 3 riser adapts to 7/32-inch-diameter cable.

(2) When tensiometer does not have adjustable risers, use the 5/32-inch-diameter tension scale.

ah. Using an inspection mirror and flashlight, check cable run over each pulley (-1) through (-10) (Figure 11-120). Make sure cable is in pulley groove and retaining pins keep cable in pulley groove.

ai. Do a tail rotor rig check (PARA 11-2).

aj. Remove rigging pins from tail rotor servo, then the mixer.

ak. Remove rigging tools from yaw and collective boost servos.

al. Turn off all hydraulic and electrical power.

am. Check area for tools, cleanness and foreign material.

an. Close drip pan and fasten latches. Connect drain tubes to drip pan (PARA 2-34).

ao. Hook cargo net in place.

ap. Install soundproofing (PARA 2-32).

aq. Close main rotor pylon sliding cover.

ar. Do an operational check of flight control system (TM 55-1520-237-T).

11-28.3 REPLACE TAIL CONE CABLES 11-28.3

REMOVE

a. Remove access panel from rear section of tail cone at station 640.

b. Remove soundproofing from rear of cabin.

c. Unhook and remove cargo panel from left or right side of fuel panel enclosure.

d. At tail rotor quadrant, install lockout blocks (PARA 11-28.1).

e. Remove locking clips from turnbuckle on right or left side.

f. Turn body of turnbuckle to loosen cable. Continue turning and remove cable terminal end.

g. Remove locknuts from quick-disconnects on right (or left) side of helicopter when removing tail cone right (or left) side cables. Separate quick-disconnects.

h. Tie a strong cord or lockwire of suitable length around cable terminal end.

i. From inside tail cone at cabin end, pull cable out through grommets until cord or lockwire appears.

j. Remove cord or lockwire from cable.

k. Remove quick-disconnect locknut from cable by sliding nut along entire length of cable and over terminal end.

INSTALL

WARNING

FLIGHT SAFETY PART

Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

l. Install locknut by sliding nut over turnbuckle end and down entire length of replacement cable.

m. Tie cord or lockwire around turnbuckle end of cable.

n. From inside tail cone, at tail end, pull on cable while assistant feeds cable through grommets.

NOTE

- Quick-disconnects have two configurations.
- Extension half bottomed in slot half (2.44 inch slot)
- Ball end bottoms before extension half (2.63 inch slot)
- Both assemblies are acceptable when torqued to specifications.

o. Connect cables at quick-disconnect. **INSTALL JAMNUT AND TORQUE 40 TO 60 INCH-POUNDS.** Lockwire, Item 199, Appendix D, jamnut to retainer.

11-28.3 REPLACE TAIL CONE CABLES 11-28.3

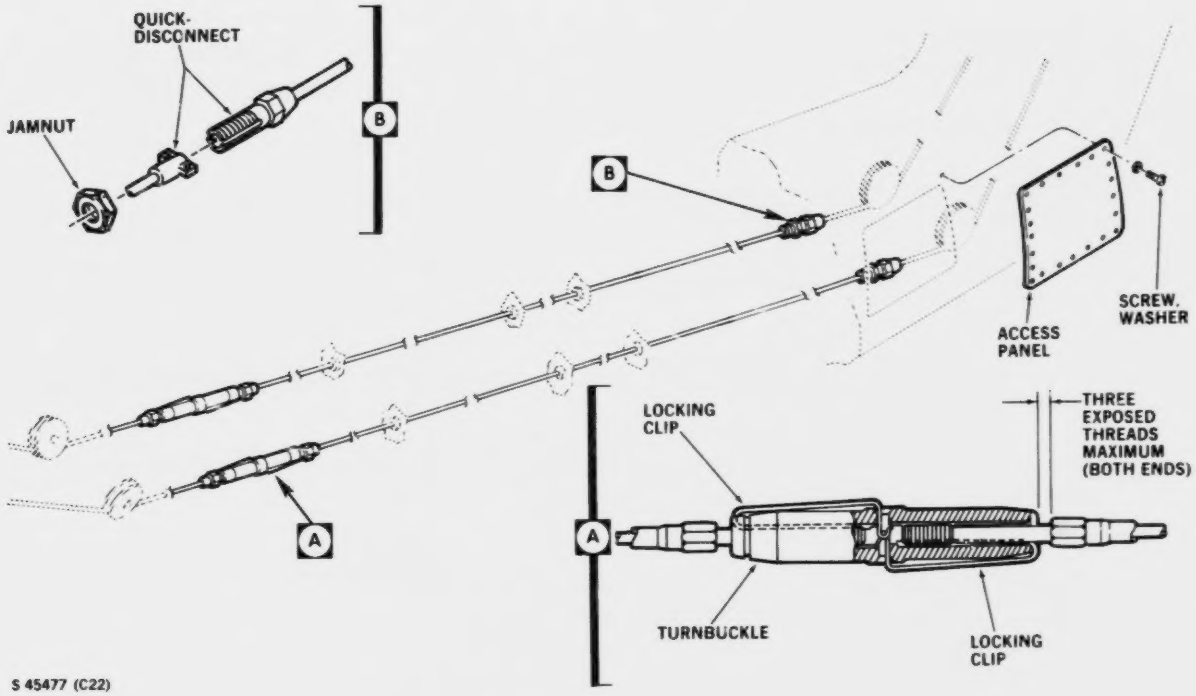

QUICK-
DISCONNECT
JAMNUT
B
B
ACCESS
PANEL
SCREW,
WASHER
THREE
EXPOSED
THREADS
MAXIMUM
(BOTH ENDS)
LOCKING
CLIP
A
A
TURNBUCKLE
LOCKING
CLIP
S 45477 (C22)

FIGURE 11-121

p. Connect cabin cable to tail cone cable at turnbuckles (PARA 11-28.2).

q. Open main gear box pylon sliding cover.

r. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	-
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

11-28.3 REPLACE TAIL CONE CABLES 11-28.3

s. Remove lockout blocks.

t. Install rigging pin in collective and yaw boost servo (PARA 11-27).

u. Install rigging pin in left side of mixer, then install rigging pin in tail rotor servo (PARA 11-2).

NOTE

Tail rotor cable tension must be stabilized on newly delivered aircraft, or on those that have had recent cable replacement. Do a tail rotor cable tension check every 9-11 flight hours, until tension stabilizes (PARA 1-6.3).

v. Adjust cable tension (PARA 11-28.2).

w. Install turnbuckle locking clips, MS21256-2 (Figure 11-121, Detail A) (TM 55-1500-204-25/1).

x. Using an inspection mirror and flashlight, check cable run over each pulley (Figure 11-121). Make sure that cable is in pulley groove and passes under retaining pins or guard.

y. Do a tail rotor rig check (PARA 11-2).

z. Remove rigging pins from tail rotor servo, then the mixer.

aa. Remove rigging pin from the yaw and collective boost servos.

ab. Do an operational check of flight control system (TM 55-1520-237-T).

ac. Turn off electrical and hydraulic power.

ad. Check all areas for cleanness and foreign material.

ae. Close main gear box pylon sliding cover.

af. Install access panel at tail cone.

ag. Install cargo panels.

ah. Install soundproofing panels (PARA 2-32).

ai. Check DA Form 2408-13 to make sure tail rotor cable tension check is shown as due at 9-11 flight hours.

11-28.4 REPLACE PYLON CABLES 11-28.4

REMOVE

a. Disconnect spring cylinders. Use alternate method in PARA 11-28.1.

b. Disconnect cables at quick-disconnects.

c. Fold tail rotor pylon (PARA 1-6.1).

d. Open tail rotor pylon drive shaft cover.

e. Remove cable guards from pulley bracket at pulley (-11), (-13), (-14) or (-12), (-15), (-16).

f. Unbolt cable guard from quadrant.

g. Turn cable 90° to quadrant. Remove from collar and quadrant.

h. Tie an 8-foot length of cord or wire to ball (upper) end of cable to be replaced.

i. Pull cable around pulleys through nylon tubes and out lower end of pylon. Untie cord or wire.

INSTALL

WARNING

FLIGHT SAFETY PART

Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

j. Tie cord or wire to ball end of replacement cable and pull cable under pulleys and up through nylon tubes and over pulleys in upper pylon.

k. Be sure cable rides in pulley grooves. Insert cable guards at pulleys.

l. Insert cable into collar at quadrant.

m. Turn cable 90° to direction cable will be going. Slide collar and cable into quadrant.

n. Be sure cable stays in groove.

o. Install cable guard on quadrant. Install spacer, screw, washer, and nut through center brackets and quadrant. Install bolt, washer, and nut in end of guard and quadrant. Install flathead screw, washer, and nut in other end. **TORQUE ALL NUTS TO 2 - 5 INCH-POUNDS.**

p. Unfold tail rotor pylon (PARA 1-6.3).

q. Connect cables at quick-disconnects (PARA 11-28.3).

r. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	-
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

11-28.4 REPLACE PYLON CABLES 11-28.4

s. Connect spring cylinders (PARA 11-28.1).

t. Install rigging pin in collective and yaw boost servo (PARA 11-27).

u. Install rigging pin in left side of mixer, then install rigging pin in tail rotor servo (PARA 11-2).

v. Adjust cable tension (PARA 11-28.2). Make sure turnbuckle is in proper safety when finished.

w. Do a rig check of tail rotor (PARA 11-2).

x. Remove rigging pins from tail rotor servo, then the mixer.

y. Remove rigging pins from the yaw and collective boost servos.

z. Do an operational check of mechanical flight control system (TM 55-1520-237-T).

aa. Turn off all electrical and hydraulic power.

ab. Using an inspection mirror and flashlight, check cable run over each pulley (-12) through (-15) (Figure 11-122). Make sure that cable is in pulley groove and passes between pulley and retaining pins or guards.

ac. Check area for cleanness and foreign material.

ad. Install tail cone access panel.

ae. Close drive shaft cover (PARA 2-54).

af. Install tail gear box front cover.

ag. Close main rotor pylon sliding cover.

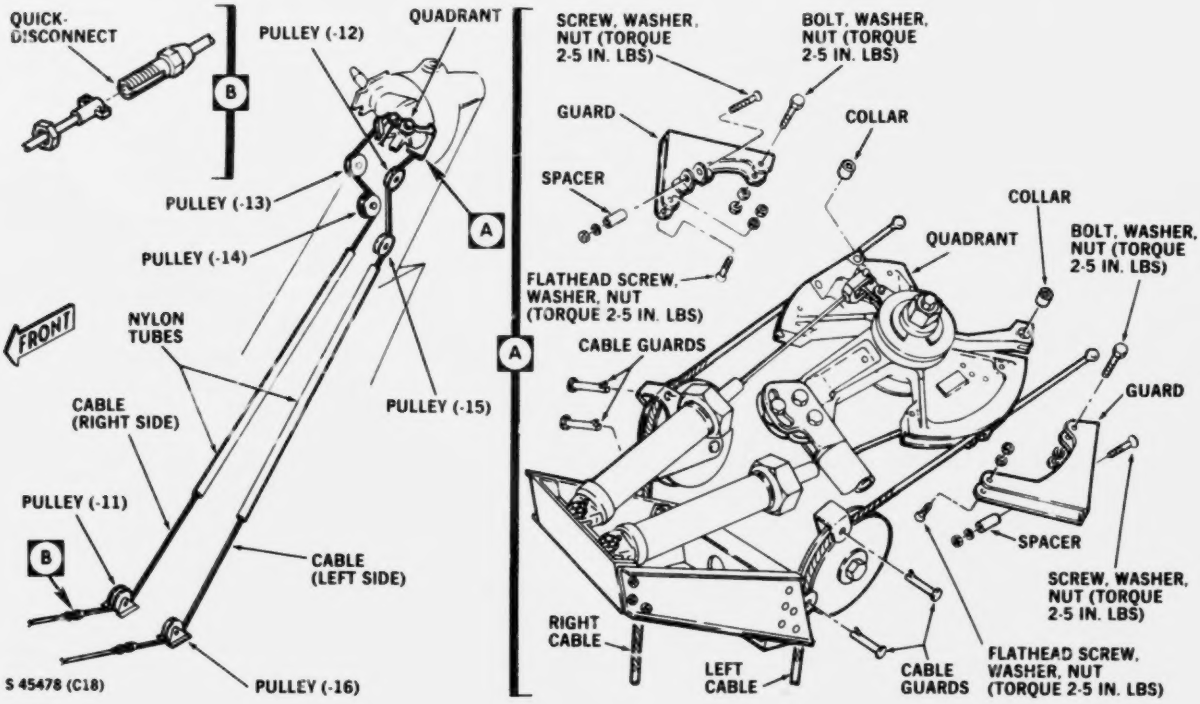

QUICK-DISCONNECT
B
PULLEY (-12)
QUADRANT
PULLEY (-13)
A
PULLEY (-14)
FRONT
NYLON TUBES
CABLE (RIGHT SIDE)
PULLEY (-15)
PULLEY (-11)
B
CABLE (LEFT SIDE)
S 45478 (C18)
PULLEY (-16)
SCREW, WASHER, NUT (TORQUE 2-5 IN. LBS)
BOLT, WASHER, NUT (TORQUE 2-5 IN. LBS)
GUARD
COLLAR
SPACER
COLLAR
QUADRANT
BOLT, WASHER, NUT (TORQUE 2-5 IN. LBS)
FLATHEAD SCREW, WASHER, NUT (TORQUE 2-5 IN. LBS)
A
CABLE GUARDS
GUARD
SPACER
SCREW, WASHER, NUT (TORQUE 2-5 IN. LBS)
RIGHT CABLE
LEFT CABLE
CABLE GUARDS
FLATHEAD SCREW, WASHER, NUT (TORQUE 2-5 IN. LBS)

FIGURE 11-122

11-28.5 REPLACE CABLE PULLEY 11-28.5

a. Install tail rotor quadrant lockout blocks or disconnect spring cylinders (PARA 11-28.1).

b. In cabin, remove soundproofing panels from cabin ceiling.

c. Remove soundproofing from right/left stowage compartment in cabin midsection. Remove baggage compartment netting.

d. To get to two pulleys at bottom of pylon, fold pylon (PARA 1-6.1). Open drive shaft cover.

e. Remove access panel from tail cone to get to cable quick-disconnects.

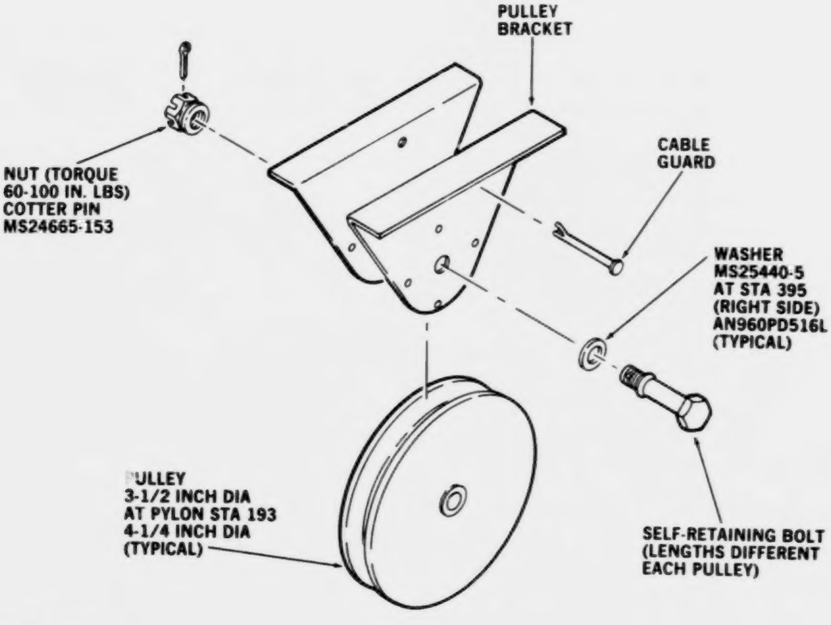
WARNING

Uncontrolled spring release may cause personal injury or damage to equipment. Be sure lockout blocks are installed or spring cylinders are disconnected (PARA 11-28.1).

f. Disconnect cable quick-disconnect on the same side where pulley is to be replaced.

g. Remove cable guard and allow cable to hang free of pulley.

h. Unbolt and remove pulley and bushings from bracket on right side, station 395.0. It may be necessary to remove stabilator amplifier (TM 11-1520-237-23-3).


PULLEY BRACKET
CABLE GUARD
NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-153
WASHER MS25440-5 AT STA 395 (RIGHT SIDE) AN960PD516L (TYPICAL)
PULLEY 3-1/2 INCH DIA AT PYLON STA 193 4-1/4 INCH DIA (TYPICAL)
SELF-RETAINING BOLT (LENGTHS DIFFERENT EACH PULLEY)
S 45533 (C13)

TYPICAL

FIGURE 11-123

11-28.5 REPLACE CABLE PULLEY 11-28.5

i. On helicopters serial Nos 77-22714 through 80-23497, unbolt pulley from brackets.

j. On helicopters serial Nos 80-23498 and subsequent, unbolt and remove pulley and bushings from bracket on station 395.50 (left).

WARNING

FLIGHT SAFETY PARTS

- Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.
- Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

k. On helicopters serial Nos 77-22714 through 80-23497, install replacement pulley between brackets.

l. Install self-retaining bolt and washers (under head) (PARA 11-1).

m. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153.

n. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

o. On helicopters serial Nos 80-23498 and subsequent, install pulley at station 395.50, left or right side, as follows:

(1) Install short bushing in inboard doubler (Figure 11-124).

(2) Install pulley and long bushing between bracket.

(3) On left side, install bolt (head outboard).

p. Install self-retaining bolt and washers (under head) (PARA 11-1).

q. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153.

r. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

s. On right side, install bolt (head inboard).

t. Install self-retaining bolt and washers (under head) (PARA 11-1).

u. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-153.

v. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH-POUNDS.** Apply slippage mark.

WARNING

FLIGHT SAFETY PART

Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

w. Put cable in pulley groove and install cable guard.

CAUTION

Misrouted control cables may cause damage to equipment. Make sure cable rests in pulley groove and guard pin tends to keep cable in pulley groove.

x. Connect cables at quick-disconnect. **TORQUE JAMNUT TO 40 - 60 INCH-POUNDS.** Lockwire, Item 199, Appendix D.

y. Remove lockout blocks or connect spring cylinders (PARA 11-28.1).

z. Do a tail rotor rig check (PARA 11-2).

aa. Check all areas for cleanness and foreign material.

ab. Install baggage compartment netting and soundproofing on right/left stowage compartment in rear cabin.

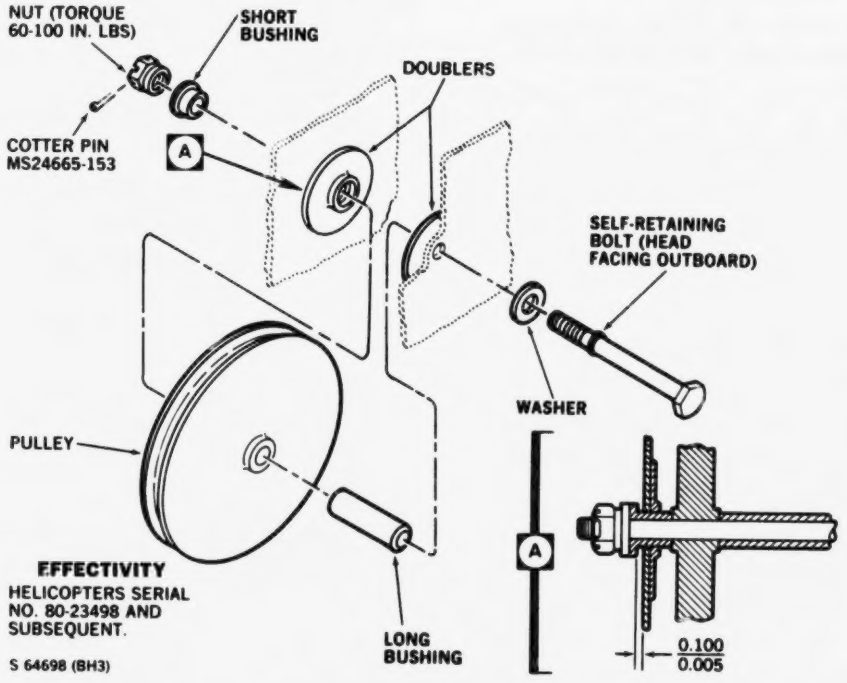
ac. Install tail cone access cover, pylon drive shaft cover, and tail gear box front cover (PARA 2-54).

ad. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

ae. Do an operational check of mechanical flight control system (TM 55-1520-237-T).

af. Turn off hydraulic and electrical power.

ag. Check DA Form 2408-13 to make sure tail rotor cable tension check is shown as due at 9-11 flight hours.


NUT (TORQUE 60-100 IN. LBS)
SHORT BUSHING
DOUBLERS
COTTER PIN MS24665-153
A
SELF-RETAINING BOLT (HEAD FACING OUTBOARD)
WASHER
PULLEY
A
0.100
0.005
LONG BUSHING
S 64698 (BH3)

EFFECTIVITY
HELICOPTERS SERIAL NO. 80-23498 AND SUBSEQUENT.

FIGURE 11-124

11-28.6 REPLACE CABLE CONDUIT 11-28.6

REMOVE

a. Remove pylon drive shaft and tail rotor gear box fairings (PARA 2-54).

b. Disconnect spring cylinders (PARA 11-28.1).

WARNING

Uncontrolled spring release may cause injury to personnel or damage to equipment. Be certain spring tension on tail rotor quadrant has been removed before unbolting spring cylinders.

c. Fold pylon (PARA 1-6.1).

d. Disconnect and remove control cables from pylon (PARA 11-28.4).

e. Cut and remove conduit from pylon.

f. Remove all remaining nylon and adhesive debris from brackets with a plastic or wooden scraper.

INSTALL

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

g. Clean top and bottom of conduit brackets with methyl ethyl ketone, Item 233, Appendix D and cheesecloth, Item 98, Appendix D. Wipe part with clean cloth until no stain shows on cloth after last wipe. Do not touch cleaned brackets.

h. Touch up bracket paint with epoxy primer, Item 150, Appendix D. Let primer dry.

i. Trim replacement conduit to 93.31 - 93.56 inch length.

j. Measure and mark a line 1/4 inch up from one end of conduit. This is the length conduit is to be extended above pylon station 180 brackets (Figure 11-125).

k. Scuff areas of conduit that pass through brackets with abrasive cloth, Item 3, Appendix D. Wipe conduit clean with methyl ethyl ketone and clean cheesecloth. Do not touch roughened areas after cleaning.

l. Prime conduit and bracket attach points with adhesive primer, Item 52, Appendix D. Allow primer to dry for at least 1 hour.

m. Position conduit in pylon brackets with 1/4 inch extending above pylon station 180. Support conduit in this position.

n. Coat each contact point with adhesive, Item 36, Appendix D. Work adhesive into contact surfaces. Maintain support until adhesive is dry.

WARNING

FLIGHT SAFETY PART

Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

o. Install cables (PARA 11-28.4).

p. Unfold pylon (PARA 1-6.1).

11-28.6 REPLACE CABLE CONDUIT 11-28.6

q. Connect cable quick-disconnects (PARA 11-28.3).

r. Connect spring cylinders (PARA 11-28.1).

s. Adjust cable tension (PARA 11-28.2).

t. Check work for correctly installed lockwire, cotter pins, and clips. Make sure cable is in pulley grooves. Check cable retaining pins for correct installation.

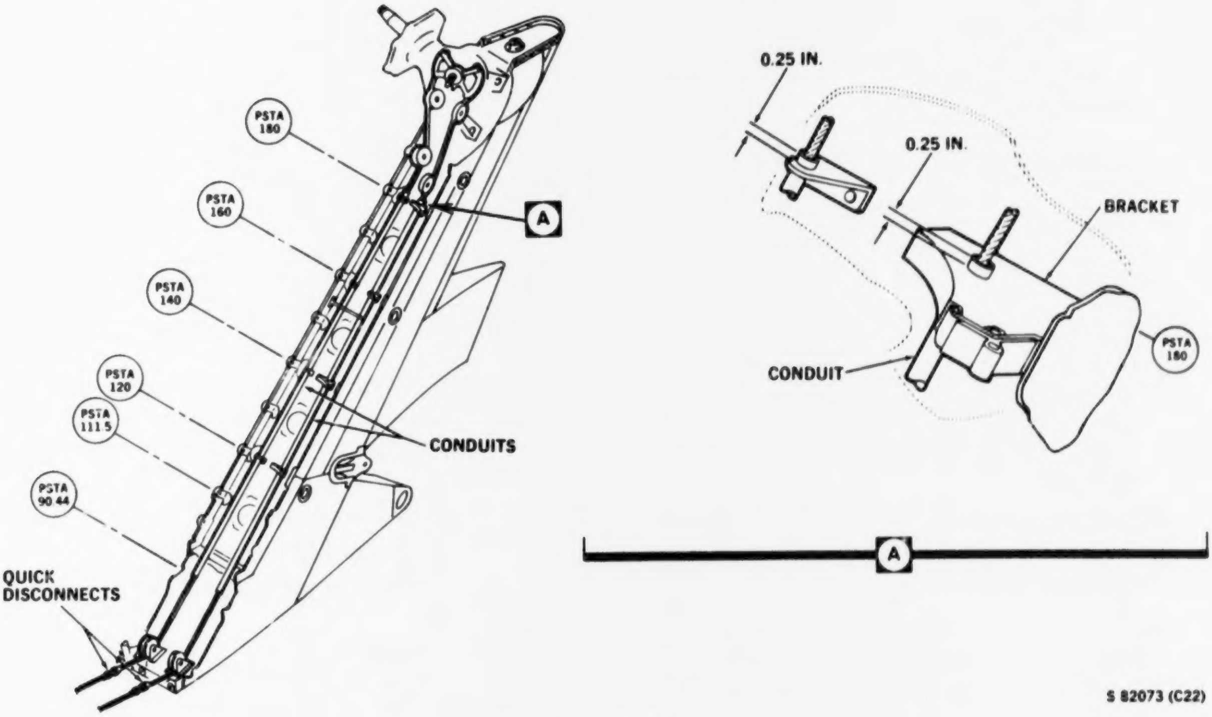
u. Check for and remove all foreign material and tools.

v. Install pylon drive shaft and tail rotor gear box fairing (PARA 6-16).

w. Do an operational check of mechanical flight controls (TM 55-1520-237-T).

x. Do a maintenance test flight (TM 55-1520-237-MTF).

y. Check DA Form 2408-13 to make sure tail rotor cable tension check, tail rotor pylon torque check, and tail rotor drive shaft torque check are shown as due 9-11 flight hours after installation.


PSTA 180
PSTA 160
PSTA 140
PSTA 120
PSTA 111.5
PSTA 90.44
QUICK DISCONNECTS
CONDUITS
A
0.25 IN.
0.25 IN.
BRACKET
CONDUIT
PSTA 180
A

S 82073 (C22)

FIGURE 11-125

11-29 TAIL ROTOR SERVO 11-29

PARAGRAPH BREAKDOWN

11-29.1 REPLACE SERVO
11-29.2 REPLACE PRESSURE SWITCH
11-29.3 REPLACE THERMAL RELIEF VALVE
11-29.4 REPLACE CONNECTORS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One - Assistant

MATERIALS/PARTS

- Acid Brush, Item 88, Appendix D
- Adhesive, Item 31, Appendix D
- Adhesive, Item 60, Appendix D
- Coating, Item 114, Appendix D
- Cotter Pin, MS24665-151
- Corrosion Preventive Compound, Item 121, Appendix D
- Degreasing Solvent, Item 131, Appendix D
- Hydraulic Fluid, Item 174, Appendix D
- Lockwire, Item 199, Appendix D
- Lockwire, Item 202, Appendix D
- Lubricating Oil, Item 221, Appendix D
- Machinery Towel, Item 227, Appendix D
- Packing, 955494-1
- Packing, M83248/1-249
- Packing, M83461/1-004
- Packing, M83461/1-008
- Packing, M83461/1-010
- Packing, M83461/1-011
- Packing, M83461/1-012
- Packing, MS28778-6
- Plugs
- Primer, Epoxy, Item 150, Appendix D
- Primer, Item 269, Appendix D
- Primer, Item 277, Appendix D
- Rags
- Retainer, 2226066-1 (FSCM 93835)
- Sealing Compound, Item 312, Appendix D
- Trichloroethane, Item 375, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Dial Indicating, Depth Gauge, 643J
- Dial Indicator, MIL-I-18422

11-29 TAIL ROTOR SERVO 11-29

TOOLS (CONT)

- Maintenance Platform
- Micrometer, GGG-C-105
- Nonmetallic Scraper, Locally-Made
- Pitch Beam Puller, 65700-10048-041
- Rawhide Hammer, E-2200-D
- Spanner Wrench, 46D7578
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 0 - 600 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686
- Torque Wrench, 700 - 1600 in. lbs, GGG-W-00686

REFERENCES

- PARA 1-4
- PARA 1-4.2
- PARA 1-6.3
- PARA 2-56
- PARA 3-17
- PARA 5-23
- PARA 5-26
- PARA 7-2
- PARA 7-3
- PARA 7-6
- PARA 7-13
- PARA 11-2
- PARA 11-27
- PARA 16-3
- TM 55-1500-204-25/1
- TM 55-1520-237-MTF
- TM 55-1520-237-T

11-29.1 REPLACE SERVO 11-29.1

REMOVE

a. Turn off all electrical and hydraulic power.

b. Remove fairing around tail gear box (PARA 2-56).

c. On upper console, place BACKUP HYD PUMP switch OFF.

d. Lock gust lock.

e. Remove pitch beam (PARA 5-23).

f. Remove pushrod from between tail rotor servo and tail rotor quadrant (PARA 11-27).

g. Remove electrical connectors from pressure switches on servo.

h. Unbolt first and second stage connectors from servo (PARA 11-29.4).

i. Cover connectors to keep dirt out of hydraulic systems while replacing servo.

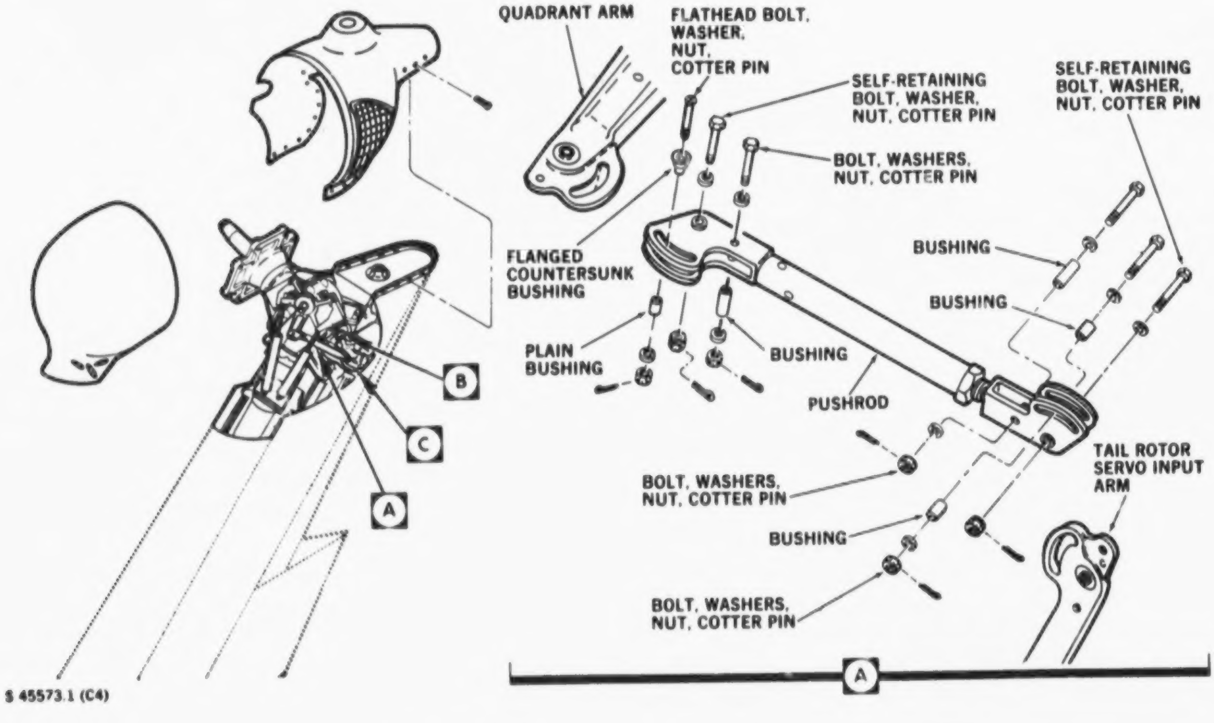

QUADRANT ARM
FLATHEAD BOLT, WASHER, NUT, COTTER PIN
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN
BOLT, WASHERS, NUT, COTTER PIN
FLANGED COUNTERSUNK BUSHING
BUSHING
BUSHING
PLAIN BUSHING
BUSHING
PUSHROD
B
C
A
TAIL ROTOR SERVO INPUT ARM
BOLT, WASHERS, NUT, COTTER PIN
BUSHING
BOLT, WASHERS, NUT, COTTER PIN
A
S 45573.1 (C4)

FIGURE 11-126 (SHEET 1 OF 3)

11-29.1 REPLACE SERVO 11-29.1

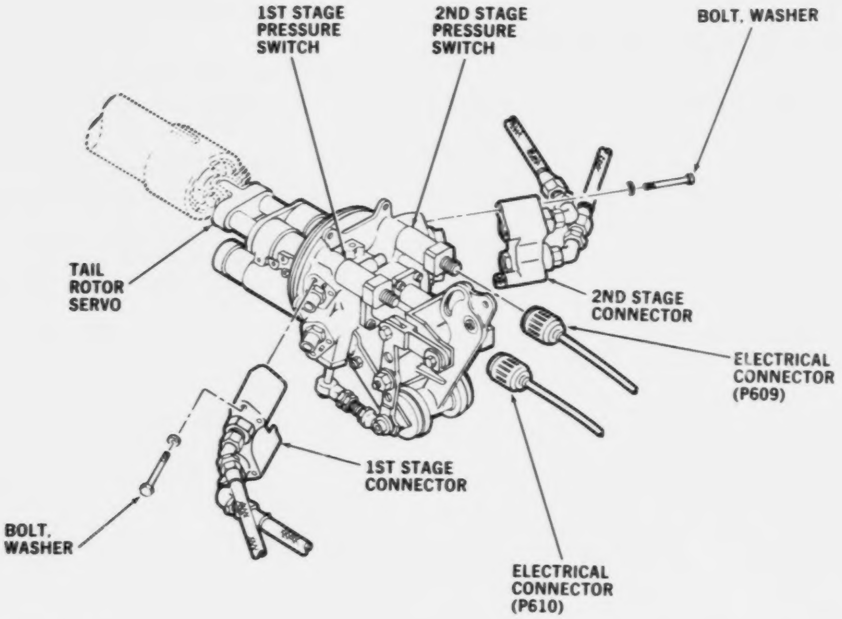

1ST STAGE PRESSURE SWITCH
2ND STAGE PRESSURE SWITCH
BOLT, WASHER
TAIL ROTOR SERVO
2ND STAGE CONNECTOR
ELECTRICAL CONNECTOR (P609)
1ST STAGE CONNECTOR
BOLT, WASHER
ELECTRICAL CONNECTOR (P610)
S 45573.2 (C22)

FIGURE 11-126 (SHEET 2 OF 3)

NOTE

Depending upon level of ground and position of helicopter, it may be necessary to drain some oil from tail gear box to prevent spilling when servo is removed (PARA 1-4).

j. Remove nuts and washers holding tail rotor servo to tail gear box.

k. With aid of assistant, carefully pull servo out of gear box.

l. Remove self-retaining bolt attaching tail rotor servo to pitch control shaft.

m. Remove packing from tail rotor servo.

n. Tag servo with reason for removal.

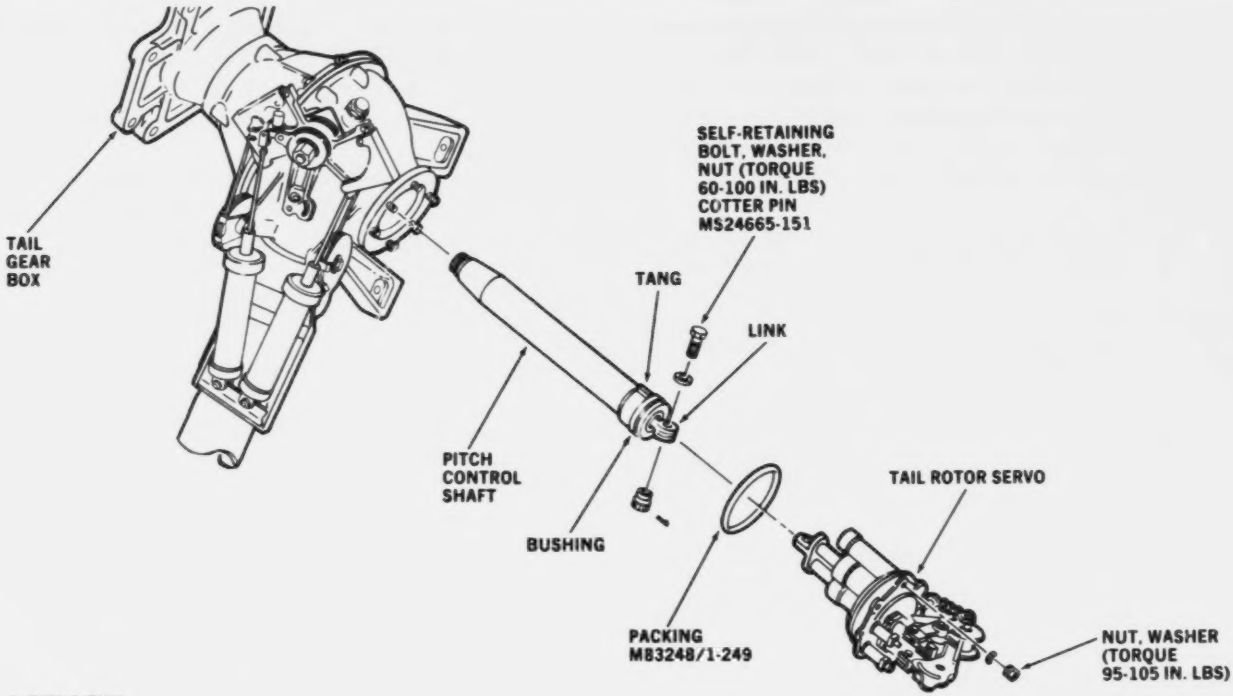

TAIL GEAR BOX
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 60-100 IN. LBS) COTTER PIN MS24665-151
TANG
LINK
PITCH CONTROL SHAFT
BUSHING
TAIL ROTOR SERVO
PACKING M83248/1-249
NUT, WASHER (TORQUE 95-105 IN. LBS)
S 45573.3 (BH4)

FIGURE 11-126 (SHEET 3 OF 3)

INSPECT/REPAIR

o. Inspect self-retaining bolt connecting tail rotor servo to pitch change shaft for radial wear using micrometer. **RADIAL WEAR NOT TO EXCEED 0.002 INCH.**

NOTE

Bearing is located inside pitch change shaft at the end of link assembly.

p. Check condition of bearing by turning pitch change shaft assembly. Replace pitch change shaft if bearing does not spin freely.

q. Inspect pitch change shaft link assembly bearing for axial play, using dial indicator. **AXIAL PLAY NOT TO EXCEED 0.020 INCH.**

r. Inspect washers bonded to clevis end of link assembly for wear. If either washer is worn 0.020 inch do the following:

(1) Loosen old adhesive from around washer using acid brush, Item 88, Appendix D, moistened with trichloroethane, Item 375, Appendix D. Using nonmetallic scraper, remove washer from link.

(2) Remove old adhesive from washers and link using a machinery towel, Item 227, Appendix D, dampened with trichloroethane, Item 375, Appendix D.

(3) Apply a coat of primer, Item 269, Appendix D, to surface of link and washers. Allow to dry for a minimum of 3 minutes.

(4) Apply a bead of adhesive, Item 60, Appendix D, to surface of link. Position and rebond washers 90° to 270° from original position. Allow to air dry for 15 minutes, undisturbed.

s. Rebond loose washer(s) using above steps.

t. Inspect servo rod end, adjacent to bearing for wear on each side of lug area, using dial indicating depth gauge. **MAXIMUM WEAR NOT TO EXCEED 0.015 INCH DEEP.**

u. Inspect servo rod end bearing for proper staking. **NO LOOSENESS ALLOWED.**

v. Inspect servo rod end bearing for axial and radial play. **MAXIMUM RADIAL AND AXIAL PLAY IS 0.020 INCH.**

w. Inspect pressed bushing on pitch control shaft. Replace shaft assembly if it is loose, cocked or it can be turned.

x. Inspect outside diameter of pressed bushing using micrometer. **MINIMUM OUTSIDE DIAMETER OF BUSHING IS 3.115 INCHES.**

y. Inspect tang using micrometer. **MINIMUM WIDTH OF TANG IS 0.299 INCH. MINIMUM OUTSIDE DIAMETER OF TANG IS 3.275.**

z. Inspect pitch control shaft surface for damage. Replace shaft if damage is found.

aa. Check piston rods for wear.

ab. Linear marks on piston rods that do not cause leakage in greater than Seal Leakage Criteria (PARA 7-2) are normal and acceptable.

ac. Clamp dial indicator to servo input arm.

ad. Place tip of indicator on end of self-retaining bolt to measure axial play, and on side of nut to measure radial play.

ae. **AXIAL PLAY ON BEARING MUST NOT BE MORE THAN 0.030 INCH.**

af. **RADIAL PLAY ON BEARING MUST NOT BE MORE THAN 0.008 INCH.**

ag. Replace servo if bearing has too much play.

NOTE

If pushrod has been removed from servo input arm, install bolt, washer, and nut in bearing to measure play.

ah. Remove spring clips from servo input link spherical bearings. Check spring clips for damage **NONE ALLOWED.** Replace damaged clips.

ai. Clamp dial indicator, to left servo input link.

aj. Place tip of indicator on end of attaching bolt to measure axial play, and on side of nut to measure radial play. Measure bearing at each end of link.

ak. Measure bearings on right servo input link in same way.

al. **AXIAL PLAY ON BEARINGS MUST NOT BE MORE THAN 0.030 INCH.**

am. **RADIAL PLAY ON BEARINGS MUST NOT BE MORE THAN 0.008 INCH.**

an. Replace servo if bearings have too much play.

ao. Clamp dial indicator to left feedback drag link.

ap. Place tip of indicator on side of summing lever to measure summing lever bearing axial play, and against end of summing lever to measure radial play.

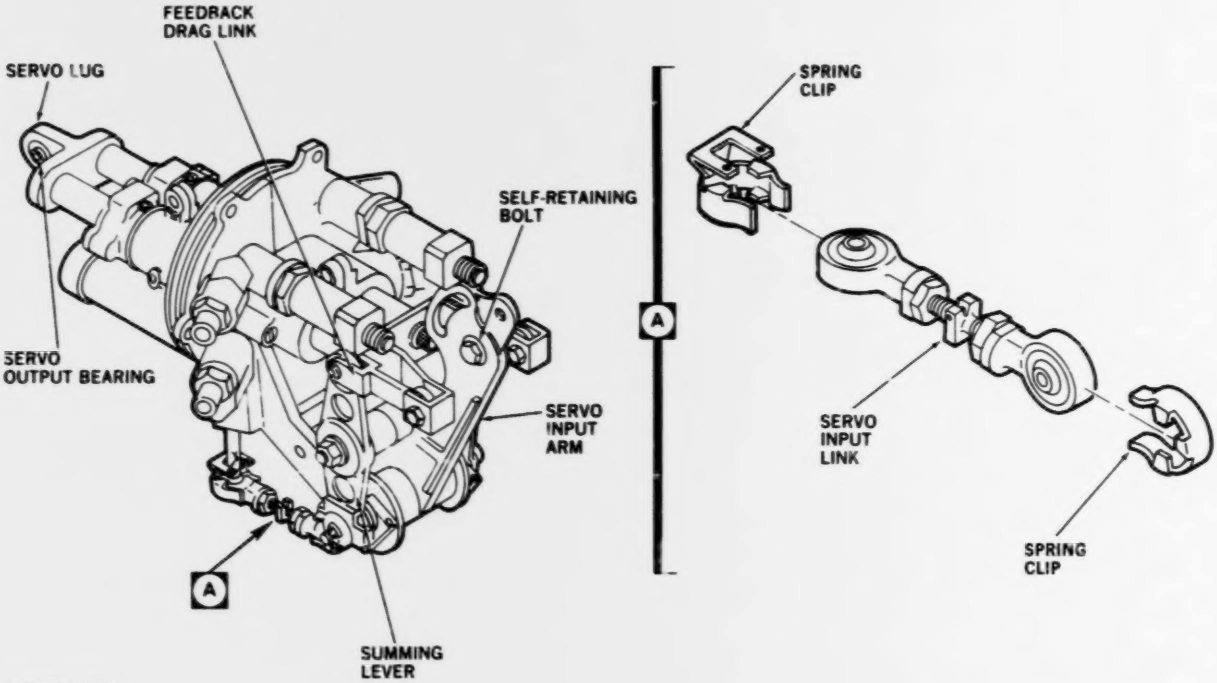
11-29.1 REPLACE SERVO 11-29.1

aq. Place tip of indicator on end of attaching bolt to measure feedback drag link bearing axial play and on side of nut to measure radial play.

ar. **AXIAL PLAY ON BEARINGS MUST NOT BE MORE THAN 0.030 INCH.**

as. **RADIAL PLAY ON BEARINGS MUST NOT BE MORE THAN 0.008 INCH.**

at. Replace servo if bearings have too much play.


FEEDBACK DRAG LINK
SERVO LUG
SELF-RETAINING BOLT
SERVO OUTPUT BEARING
SERVO INPUT ARM
A
SUMMING LEVER
SPRING CLIP
A
SERVO INPUT LINK
SPRING CLIP

S 53778.1 (BH4)

FIGURE 11-127 (SHEET 1 OF 2)

au. Install spring clips servo input link spherical bearings (Figure 11-127, Detail A), Lockwire, Item 202, Appendix D, spring clips. **REPLACE DAMAGED CLIPS.**

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

av. Turn off all electrical and hydraulic power.

aw. Coat packing, M83248/1-249, with lubricating oil, Item 221, Appendix D, before installing.

ax. Thoroughly clean servo packing groove, tail rotor gear box-servo interface flanges, studs, stud holes, washers, and nuts with degreasing solvent, Item 131, Appendix D, rags and brush. Wipe dry with clean rags. Do not touch treated surfaces.

ay. Install packing, M83248/1-249, on replacement tail rotor servo. Wipe off excess oil.

CAUTION

Proper installation of self-retaining bolt through the output rod end and link assembly is critical. If proper clamp up of this joint is not achieved, accelerated self-retaining bolt wear could occur and lead to bolt failure.

az. Connect pitch control shaft and tail rotor servo.

TABLE 11-12

Washer Thickness (Inch)	**Quantity**
0.032	1
or	
0.032	2
or	
0.032	3
or	
0.032	1
0.063	1

ba. Install self-retaining bolts and washers (under head), as follows:

(1) Refer to Table 11-12 for proper washer stackup on bolt.

(2) Install self-retaining bolts and washers (under head).

(3) Check bolts for free axial motion and that impedance feature is not restrained in part. If bolts bind or impedance feature is depressed, change washer stackup using Table 11-12, or use next longer or shorter bolt.

bb. Install nut on bolt. **TORQUE NUT TO 60 - 100 INCH-POUNDS.** Install cotter pin, MS24665-151.

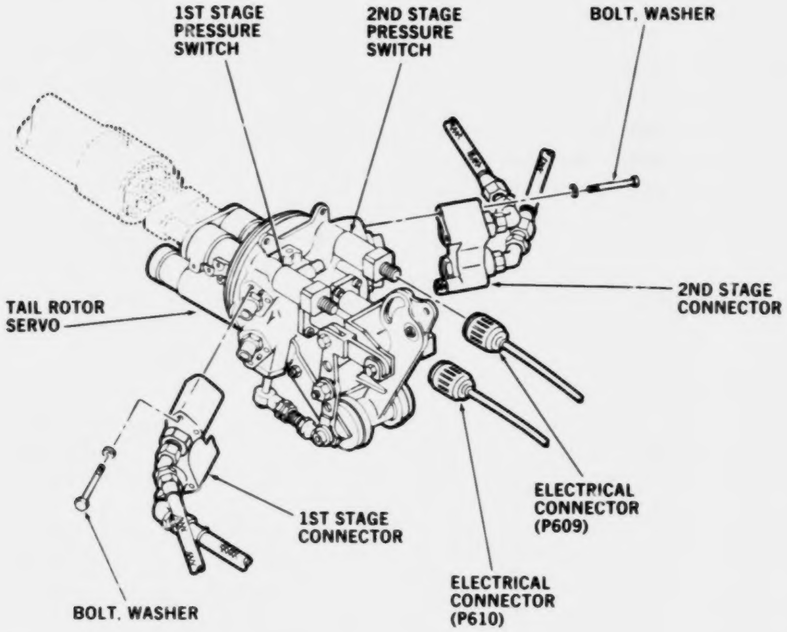
bc. **PROOF TORQUE BOLTHEAD TO 30 - 32 INCH POUNDS.** Apply slippage mark.

CAUTION

Bending of the input servo stem will result in a sticking or stiff servo. Take care when handling the tail rotor servo to avoid bending or damaging servo linkages.

bd. Apply a thin, even coat of epoxy primer, Item 150, Appendix D, or primer, Item 277, Appendix D, to tail rotor gear box-servo flanges, studs, and stud holes. Install servo in gear box while primer is wet.

11-29.1 REPLACE SERVO 11-29.1


1ST STAGE PRESSURE SWITCH
2ND STAGE PRESSURE SWITCH
BOLT, WASHER
2ND STAGE CONNECTOR
TAIL ROTOR SERVO
ELECTRICAL CONNECTOR (P609)
1ST STAGE CONNECTOR
ELECTRICAL CONNECTOR (P610)
BOLT, WASHER

S 53778.2 (C22)

FIGURE 11-127 (SHEET 2 OF 2)

be. With aid of assistant, line up shaft keys with key ways in output gear inside tail gear box. Slide pitch control shaft and servo into tail gear box. Install servo on gear box studs. Paint washer and nut contact surfaces with epoxy primer, Item 150, Appendix D, or primer, Item 277, Appendix D. Install washers and nuts. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

bf. Cover nuts and washers and fill seam between tail rotor gearbox servo mounting flange and tail gearbox housing with sealing compound, Item 312, Appendix D.

bg. Make a bead around seam using excess sealing compound.

bh. Paint sealant with epoxy primer, Item 150, Appendix D, after sealing compound has cured.

bi. Coat primer with polyurethane coating, Item 251, Appendix D.

bj. Install pushrod between servo input arm and quadrant arm (PARA 11-27).

CAUTION

To prevent getting dirt in hydraulic systems, be sure mounting faces of servo and connectors are clean before installing connectors.

bk. Install 1st and 2nd stage connectors (PARA 11-29.4).

11-29.1 REPLACE SERVO 11-29.1

bl. Connect electrical connectors, P610 and P609, to 1st stage and 2nd stage pressure switches.

bm. Install pitch beam (PARA 5-23).

bn. Attach pitch change links and bonding jumpers to blade horns and pitch change beam (PARA 5-23). Do not torque pitch change link attaching hardware now.

bo. Turn on an external source of electrical power or run APU (PARA 1-6.3).

bp. On overhead console, place BACKUP HYD PUMP switch ON.

bq. Check caution panel, that #1 TAIL RTR SERVO and #2 TAIL RTR SERVO ON capsules are off.

br. On lower console, place TAIL SERVO switch to BACKUP.

bs. Check caution panel, that #1 TAIL RTR SERVO and #2 TAIL RTR SERVO ON capsules are on.

bt. Place TAIL SERVO switch to NORMAL.

bu. Check caution panel that #1 TAIL RTR SERVO and #2 TAIL ROTOR SERVO ON capsules are off.

bv. Check tail rotor servo for leaks.

bw. Turn off electrical power.

bx. Open main rotor sliding cover.

by. Service and bleed hydraulic reservoirs as necessary (PARA 7-3).

bz. If tail rotor servo hoses or tubes were disconnected, removed, or installed, test servo for correct plumbing connections (PARA 7-13).

ca. Rig tail rotor and check tail rotor servo for bottoming (PARA 11-2).

cb. Service tail gear box with oil if necessary (PARA 1-4.2).

cc. If blade deice kit is installed, connect electrical connectors (PARA 16-3).

cd. Inspect for bent input pilot valve stem by doing this:

CAUTION

To prevent overheating backup hydraulic system, use this chart for limits when running backup pump.

Surrounding Temperature F° (C°)	Operating Time (Minutes)	Cool-down Time, Pump Off (Minutes)
90° (32°) max	Unlimited	–
91° (33°) to 100° (38°)	24	72
101° (39°) to 125° (52°)	16	48

(1) Turn on electrical power or operate APU (PARA 1-6.3).

(2) On overhead control panel, place BACKUP HYD PUMP switch ON.

11-29.1 REPLACE SERVO 11-29.1

(3) Have assistant position and hold controls as follows:

CONTROL	POSITION
Collective	Full Down
Cyclic	Centered
Pedals	Full Right

(4) Check for a minimum clearance (0.078 inch) between pivot/stop pin and summing lever tangs on 1st and 2nd stage servos (four places). **IF CLEARANCE IS NOT AS SPECIFIED REPLACE SERVO** (Figure 11-127).

NOTE

1st stage valve stem is forward stem.

(5) Turn 1st stage valve stem 45° by hand. Recheck 1st stage summing lever tang and pivot/ stop pin clearance. If drill rod can be inserted, continue turning valve stem by 45° steps until pilot valve stem has been turned 360° without binding or clamping measuring tool.

(6) Place tail rotor servo switch to BACKUP.

(7) Turn backup stage valve stem 45° by hand. Recheck backup stage summing lever tang and pivot/stop pin clearance. If drill rod can be inserted, continue turning valve stem by 45° steps until valve stem has been turned 360° without binding or clamping measuring tool.

(8) **IF 1ST STAGE OR BACKUP STAGE PILOT VALVE STEM FAILS CLEARANCE CHECK WHILE TURNING VALVE STEMS, REPLACE SERVO ASSEMBLY.**

(9) On overhead control panel, place BACKUP HYD PUMP switch OFF.

(10) Turn off electrical power or shut down APU (PARA 1-6.3).

ce. Check area for cleanness and foreign material.

cf. Do a tail rotor rig check (PARA 11-2).

cg. Do an operational check of tail rotor flight control system (TM 55-1520-237-T).

ch. Install tail rotor gear box fairings (PARA 2-56).

NOTE

If tail gear box output flange bolts were loosened or removed, a tail rotor balance check is required only after torque has stabilized (PARA 5-26).

ci. Do a maintenance test flight (TM 55-1520-237-MTF).

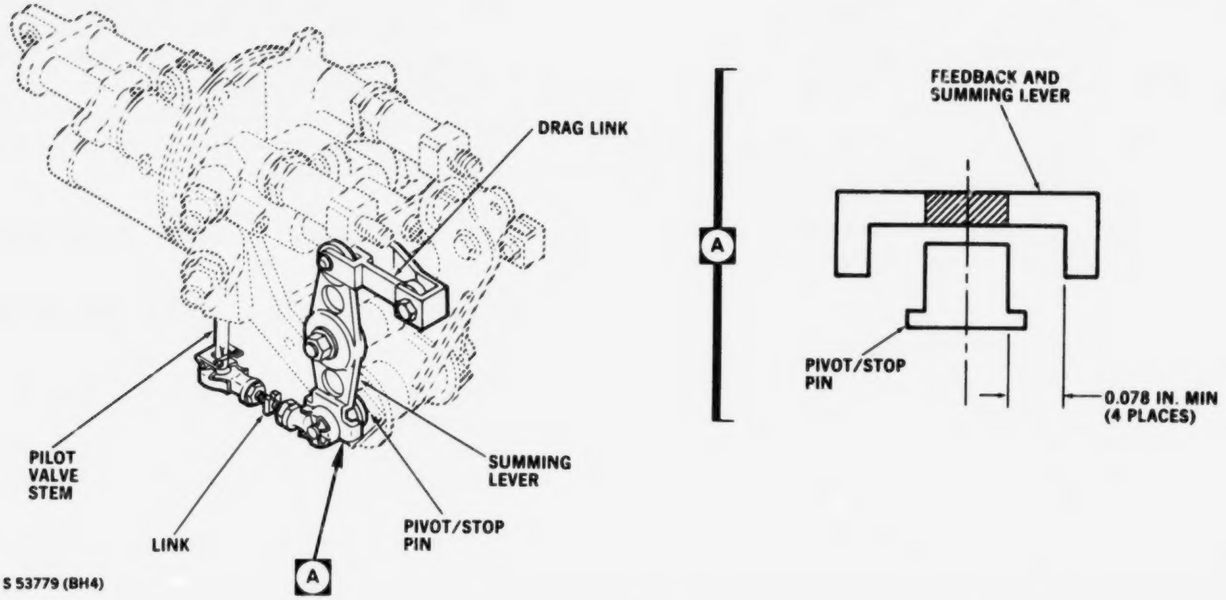

DRAG LINK
PILOT VALVE STEM
LINK
SUMMING LEVER
PIVOT/STOP PIN
A
S 53779 (BH4)
A
FEEDBACK AND SUMMING LEVER
PIVOT/STOP PIN
0.078 IN. MIN (4 PLACES)

FIGURE 11-128

11-29.2 REPLACE PRESSURE SWITCH 11-29.2

REPLACE

a. Turn off all electrical and hydraulic power.

b. Unfasten and remove front tail gear box cover.

NOTE

Have replacement pressure switch and packings ready to install before removing installed pressure switch. 1ST and 2ND stage pressure switch part numbers are different. Be sure you have correct part number switch ready.

c. Disconnect electrical connector from pressure switch.

d. Coat packings M83461/1-011 and MS28778-6 with hydraulic oil, Item 174, Appendix D, and install on replacement pressure switch. Coat threads of pressure switch with hydraulic oil.

e. Use rags to catch any spilled hydraulic oil. Unscrew installed pressure switch.

f. Install replacement pressure switch. **TORQUE TO 152 - 168 INCH-POUNDS.** Lockwire, Item 199, Appendix D.

g. Connect electrical connector, P610 for 1ST stage, P609 for 2ND stage. Lockwire, MS20995NC20.

h. Turn on an external source of electrical power or run APU (PARA 1-6.3).

i. On overhead console, place BACKUP HYD PUMP switch ON.

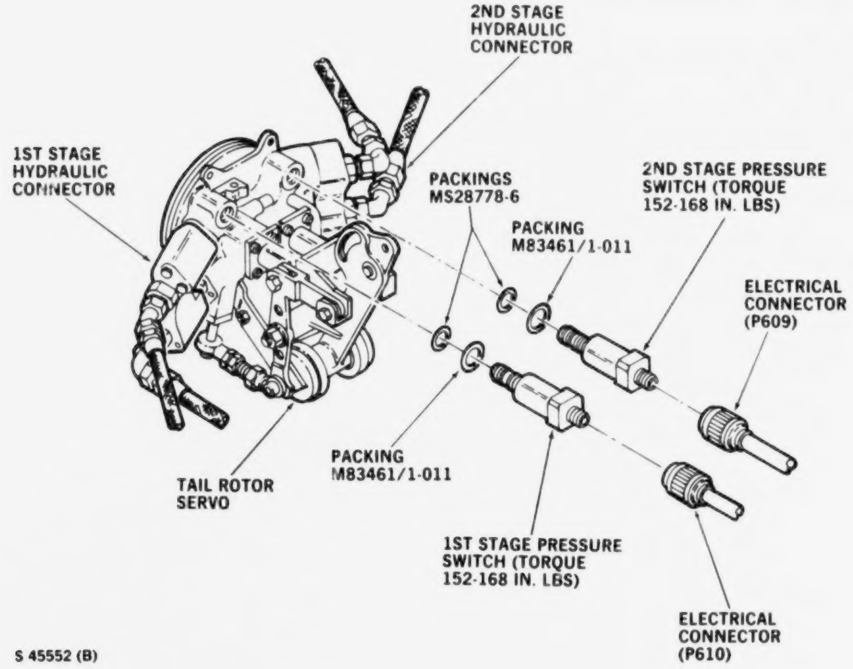

2ND STAGE HYDRAULIC CONNECTOR
1ST STAGE HYDRAULIC CONNECTOR
PACKINGS MS28778-6
2ND STAGE PRESSURE SWITCH (TORQUE 152-168 IN. LBS)
PACKING M83461/1-011
ELECTRICAL CONNECTOR (P609)
PACKING M83461/1-011
TAIL ROTOR SERVO
1ST STAGE PRESSURE SWITCH (TORQUE 152-168 IN. LBS)
ELECTRICAL CONNECTOR (P610)
S 45552 (B)

FIGURE 11-129

11-29.2 REPLACE PRESSURE SWITCH 11-29.2

j. Check caution panel, that #1 TAIL RTR SERVO and #2 TAIL ROTOR SERVO ON capsules are off.

k. On lower console, place TAIL SERVO switch to BACKUP.

l. Check caution panel, that #1 TAIL RTR SERVO and #2 TAIL RTR SERVO ON capsules are on.

m. Place TAIL SERVO switch to NORMAL.

n. Check caution panel that #1 TAIL RTR SERVO and #2 TAIL ROTOR SERVO ON capsules are off.

o. Check tail rotor servo for leaks.

p. Open main rotor sliding cover.

q. Service and bleed backup pump reservoir if necessary (PARA 7-6).

r. Check area for cleanness and foreign material.

s. Close main rotor sliding cover.

t. Place BACKUP HYD PUMP switch OFF.

u. Turn off APU or electrical power (PARA 1-6.3).

v. Check area for cleanness and foreign material.

w. Install front tail gear box cover and fasten.

11-29.3 REPLACE THERMAL RELIEF VALVE 11-29.3

REPLACE

a. Turn off all electrical and hydraulic power.

b. Unfasten and remove front tail gear box cover.

NOTE

Have replacement thermal relief valve ready to install before removing installed valve so not to spill too much oil when replacing it.

c. Coat replacement thermal relief valve and packing with hydraulic fluid, Item 174, Appendix D.

d. Install new packing, M83461/1-008, on replacement valve.

e. Use rags to catch any spilled oil. Unscrew installed valve and install replacement thermal relief valve.

f. **TIGHTEN UNTIL A SHARP RISE IN TORQUE IS FELT, THEN TIGHTEN 1/4 TURN MORE.** Lockwire, Item 199, Appendix D, valves to each other.

g. Turn on electrical power or run APU (PARA 1-6.3).

h. On overhead console, place BACKUP HYD PUMP switch ON. Check for leaks.

NOTE

If 2ND stage thermal relief valve is being replaced on lower console, place TAIL SERVO switch to BACKUP.

i. Place TAIL SERVO switch to NORMAL. Place BACKUP HYD PUMP switch OFF.

j. Service backup pump reservoir, if necessary (PARA 7-6).

k. Turn off APU or electrical power.

l. Check area for cleanness and foreign material.

m. Install tail gear box front cover and fasten.

11-29.3 REPLACE THERMAL RELIEF VALVE 11-29.3

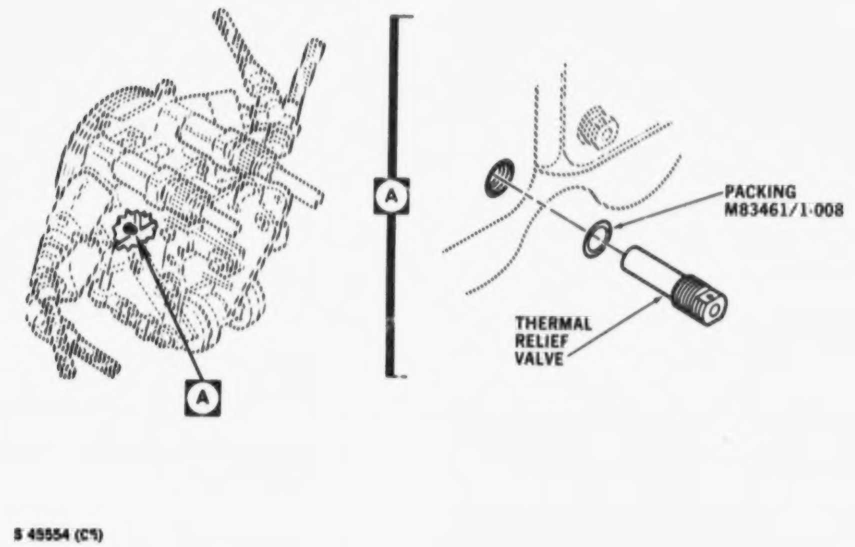

A
A
PACKING
M83461/1-008
THERMAL
RELIEF
VALVE
S 45554 (C5)

FIGURE 11-130

11-29.4 REPLACE CONNECTORS 11-29.4

REMOVE

a. Turn off all electrical and hydraulic power.

b. Unfasten and remove front tail gear box cover.

c. On overhead console, place BACKUP HYD PUMP switch OFF.

d. Use rags to catch any spilled hydraulic oil as hoses are disconnected.

e. Disconnect pressure and return hoses from connector.

NOTE

If connector is not to be replaced now, plug hoses to keep dirt out.

f. Unbolt and remove 1st and 2nd stage connector from tail rotor servo.

REPLACE ADAPTERS

CAUTION

To keep dirt from system, have replacement adapter(s) ready for immediate installation. Make sure area around adapter(s) is clean.

g. Remove large or small adapter(s) from connector and remove packing(s) from adapter(s).

h. Lightly coat packing(s), M83461/1-010, with hydraulic fluid, Item 174, Appendix D, and install on small adapter(s).

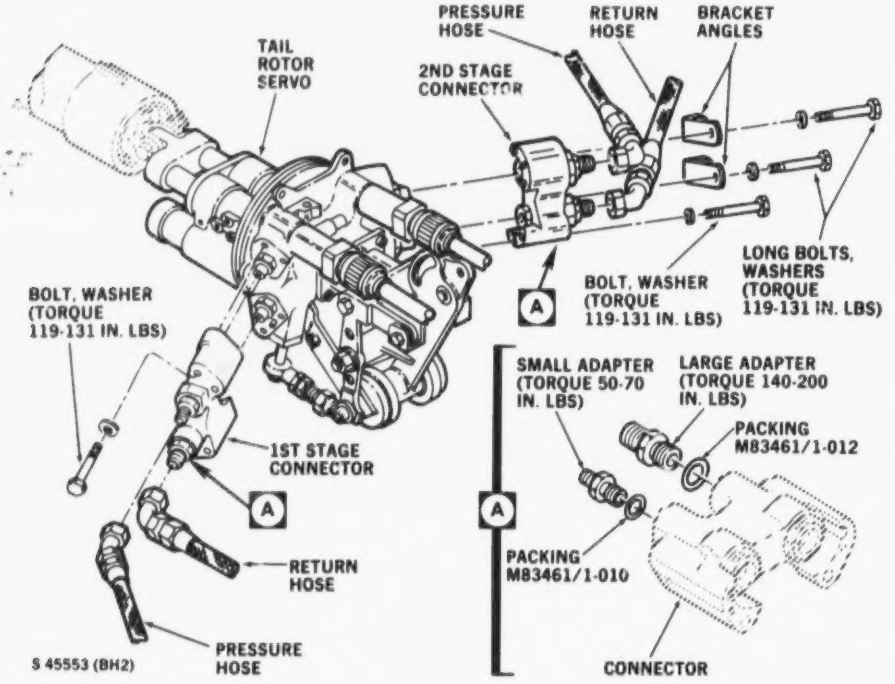

PRESSURE HOSE
RETURN HOSE
BRACKET ANGLES
TAIL ROTOR SERVO
2ND STAGE CONNECTOR
LONG BOLTS, WASHERS (TORQUE 119-131 IN. LBS)
BOLT, WASHER (TORQUE 119-131 IN. LBS)
A
BOLT, WASHER (TORQUE 119-131 IN. LBS)
SMALL ADAPTER (TORQUE 50-70 IN. LBS)
LARGE ADAPTER (TORQUE 140-200 IN. LBS)
PACKING M83461/1-012
1ST STAGE CONNECTOR
A
A
PACKING M83461/1-010
RETURN HOSE
PRESSURE HOSE
S 45553 (BH2)
CONNECTOR

FIGURE 11-131

11-29.4 REPLACE CONNECTORS 11-29.4

i. Lightly coat threads of small adapter(s) with hydraulic fluid, Item 174, Appendix D, and install adapter(s) in connector. **TORQUE SMALL ADAPTER(S) TO 50 - 70 INCH-POUNDS.**

j. Lightly coat packing(s), M83461/1-012, with hydraulic fluid, Item 174, Appendix D, and install on large adapter(s).

k. Lightly coat threads of large adapter(s) with hydraulic fluid, Item 174, Appendix D, and install adapter(s) in connector. **TORQUE LARGE ADAPTER(S) TO 140 - 200 INCH-POUNDS.**

INSTALL

l. Line up 1st stage connector with guide pins and tail rotor servo fittings and install. Bolt 1st stage connector to tail rotor servo. **TORQUE BOLTS TO 119 - 131 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts.

m. Line up 2nd stage connector with guide pins and tail rotor servo fittings and install. Install bracket angles to 2nd stage connector using long bolts. **TORQUE BOLTS TO 119 - 131 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts.

n. Remove plugs if installed and connect pressure and return hoses to connector.

TEST

o. Open main rotor pylon sliding cover.

p. Disconnect tail rotor servo input pushrod from tail rotor servo input lever (PARA 11-27).

q. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

r. If using backup pump, on overhead console, place BACKUP HYD PUMP switch ON.

s. On lower console, place TAIL RTR SERVO switch to NORMAL.

t. Hold right pedal to move servo input pushrod out of way as required.

u. Move tail rotor servo input lever to full extended positon. Release lever. **SERVO SHALL MOVE BACK TO MIDSTROKE POSITION.**

v. If servo does not center, check for crossed 1ST stage pressure and return lines. Correct crossed line condition. Recheck servo for correct hydraulic line installation.

w. Place TAIL RTR SERVO switch to BACKUP.

x. Move servo input lever to full extended position. Release lever. **SERVO SHALL MOVE BACK TO MIDSTROKE POSITION.**

y. If servo does not center, check for crossed 2ND stage pressure and return lines. Correct crossed line condition. Recheck servo for correct hydraulic line installation.

z. Turn off hydraulic power.

aa. Connect tail rotor servo input pushrod tail rotor servo input lever (PARA 11-27)

ab. Check for leaks, check caution panel capsules, BACKUP HYD PUMP ON, #2 TAIL RTR SERVO ON, or #1 TAIL RTR SERVO are on.

ac. If necessary, service backup pump reservoir (PARA 7-6).

ad. Place TAIL RTR SERVO switch to NORMAL, BACKUP HYD PUMP switch to OFF.

ae. Turn off hydraulic and electrical power.

af. Check areas for cleanness and foreign material before closing cover or replacing panels.

ag. Close main rotor pylon sliding cover. Install tail gear box front cover and fasten.

11-30 TAIL ROTOR QUADRANT 11-30

PARAGRAPH BREAKDOWN

11-30.1	REPLACE TAIL ROTOR QUADRANT
11-30.2	REPLACE TAIL ROTOR QUADRANT SUPPORT
11-30.3	REPAIR TAIL ROTOR QUADRANT
11-30.4	TAIL ROTOR QUADRANT FUNCTIONAL CHECK
11-30.5	REPLACE SPRING CYLINDERS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68G - Aircraft Structural Repairer
- One: - Assistant

MATERIALS/PARTS

- Abrasive Cloth, Item 1, Appendix D
- Adhesive, Item 404, Appendix D
- Cotter Pin, MS24665-153
- Dry-Cleaning Solvent, Item 135, Appendix D
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Rivet, MS20613-4C10
- Rivet, MS20613-4C16
- Screw, MS21091-4004

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Airframe Repairer's Toolkit, SC 5180-99-CL-A02
- Spring Scale, AAA-S133
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686

REFERENCES

- PARA 1-6.3
- PARA 2-56
- PARA 11-1
- PARA 11-2
- PARA 11-28
- TM 55-1520-237-T

11-30.1 REPLACE TAIL ROTOR QUADRANT 11-30.1

REMOVE

a. Turn off all electrical and hydraulic power.

b. Remove tail gear box front fairing.

c. Disconnect spring cylinders. Use alternate method in PARA 11-28.

d. Remove access panel in tailcone and disconnect cables at quick-disconnects (Detail B).

e. Unbolt push rod from between tail rotor quadrant and tail rotor servo (Detail A).

f. Unbolt cable guards from quadrant. Remove spacers (Detail D).

g. Slide cable and collar from quadrant and remove cable from collar.

h. Remove adjusting nuts and remove right and left microswitches from quadrant. Place microswitches out of way (Detail E).

i. Remove safety bolt (right-hand thread) from nut at top of quadrant. Remove large nut (left-hand thread) and large washer. Remove quadrant with spring cylinders from tail gear box. Remove bottom large washer.

j. Repair tail rotor quadrant as necessary (PARA 11-30.2).

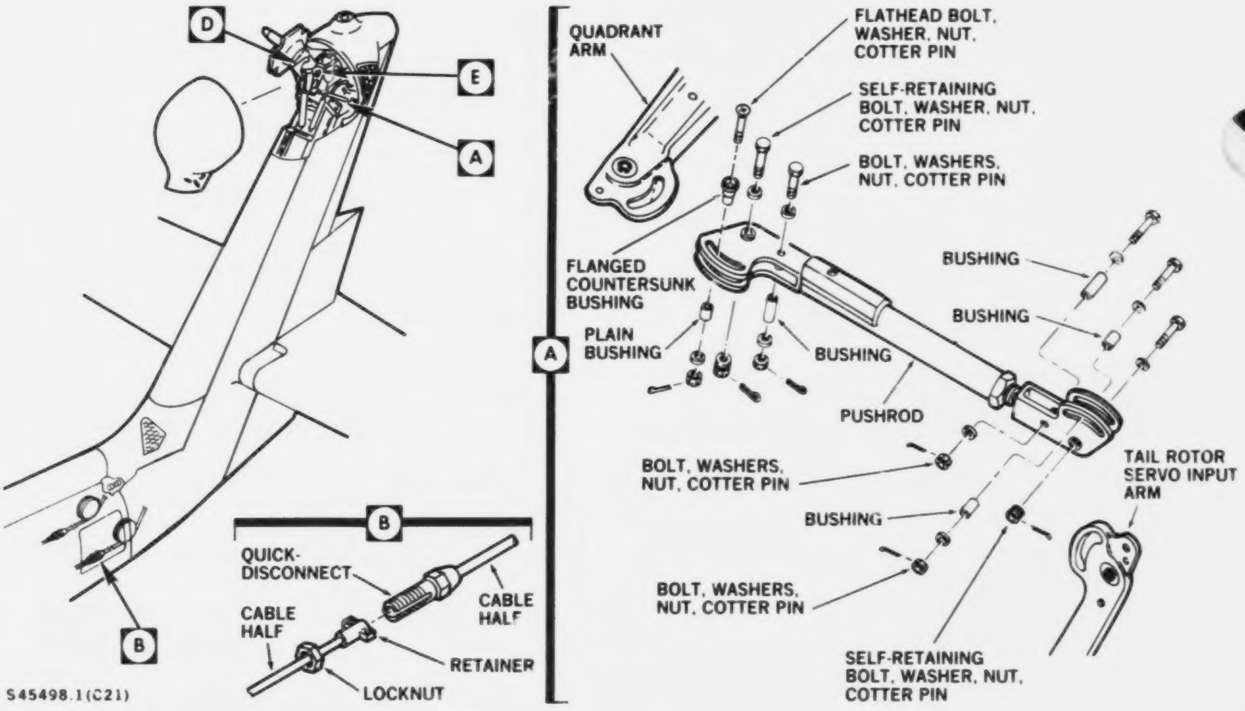

D
E
A
B
S45498.1(C21)
B
QUICK-DISCONNECT
CABLE HALF
CABLE HALF
RETAINER
LOCKNUT
A
QUADRANT ARM
FLATHEAD BOLT, WASHER, NUT, COTTER PIN
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN
BOLT, WASHERS, NUT, COTTER PIN
BUSHING
FLANGED COUNTERSUNK BUSHING
BUSHING
PLAIN BUSHING
BUSHING
PUSHROD
BOLT, WASHERS, NUT, COTTER PIN
TAIL ROTOR SERVO INPUT ARM
BUSHING
BOLT, WASHERS, NUT, COTTER PIN
SELF-RETAINING BOLT, WASHER, NUT, COTTER PIN

FIGURE 11-132 (SHEET 1 OF 2)

11-30.1 REPLACE TAIL ROTOR QUADRANT 11-30.1

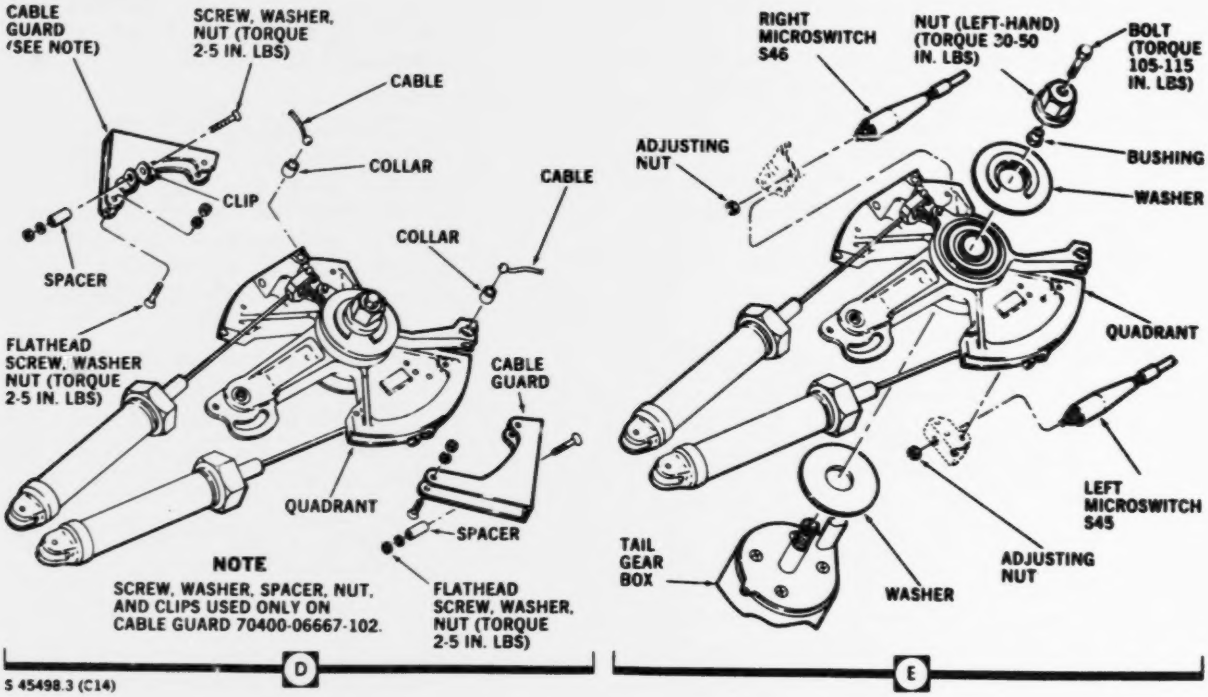

CABLE GUARD (SEE NOTE)
SCREW, WASHER, NUT (TORQUE 2-5 IN. LBS)
CABLE
COLLAR
CLIP
CABLE
COLLAR
SPACER
FLATHEAD SCREW, WASHER NUT (TORQUE 2-5 IN. LBS)
CABLE GUARD
QUADRANT
SPACER
NOTE
SCREW, WASHER, SPACER, NUT, AND CLIPS USED ONLY ON CABLE GUARD 70400-06667-102.
FLATHEAD SCREW, WASHER, NUT (TORQUE 2-5 IN. LBS)
D
S 45498.3 (C14)
RIGHT MICROSWITCH S46
NUT (LEFT-HAND) (TORQUE 30-50 IN. LBS)
BOLT (TORQUE 105-115 IN. LBS)
ADJUSTING NUT
BUSHING
WASHER
QUADRANT
LEFT MICROSWITCH S45
TAIL GEAR BOX
WASHER
ADJUSTING NUT
E

FIGURE 11-132 (SHEET 2 OF 2)

k. Install large washer on tail gear box. Install replacement tail rotor quadrant on stud. Install large washer (with decals) on stud (Figure 11-132, Sheet 2, Detail E).

l. Thread large left hand threaded nut on stud. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install safety bolt (right hand thread) through large nut into stud. **TORQUE BOLT TO 105 - 115 INCH-POUNDS.** Lockwire, Item 200, Appendix D, bolt.

m. Install right microswitch, S46, in bracket on quadrant. Install adjusting nut. Install left microswitch, S45, in bracket on quadrant. Install adjusting nut. Switches will be adjusted later.

WARNING

FLIGHT SAFETY PART

Verification of proper cable routing over quadrants and pulleys, and under cable retainers are critical characteristics.

n. Install cables in collars and slide cables and collars in quadrant. Be sure cables are in quadrant grooves (Figure 11-132, Sheet 2, Detail D).

11-30.1 REPLACE TAIL ROTOR QUADRANT 11-30.1

o. Install cable guards. On cable guard, 70400-06667-102, only, put spacers between ears of brackets and install screws. **TORQUE SCREWS TO 2 - 5 INCH-POUNDS.**

p. Install screws, washers, and nuts (nuts up) through cable guard and quadrant. **TORQUE NUTS TO 2 - 5 INCH-POUNDS.**

q. Reconnect spring cylinders to support (PARA 11-28).

INSTALL

WARNING

FLIGHT SAFETY PARTS

Verification of proper hardware installation, torque, safety installation, and proof torque of self-retaining bolts are critical characteristics.

r. Install push rod between tail rotor quadrant and tail rotor servo input arm.

s. Install self-retaining bolt and washers (under head) (PARA 11-1).

t. Install nut on bolt. **TORQUE NUT TO 30 - 50 INCH-POUNDS.** Install cotter pin, MS24665-153.

u. **PROOF TORQUE BOLTHEAD TO 15 - 17 INCH-POUNDS.** Apply slippage mark.

v. At servo input arm, install long bushing in rod end and slot of servo arm. Install bolt (1-7/16 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pins, MS24665-153.

w. At servo end, install short bushings in slots each side of rod end. Install bolt (1-3/16 inch long), washers, and nut. **TORQUE NUT 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

x. At quadrant arm, install flanged countersunk bushing in top slot of rod end. (Figure 11-132, Sheet 1, Detail A). Install plain bushing in bottom slot of rod end. Install flathead bolt in bushings and quadrant arm. Install washer and nut. **TORQUE NUT TO 23 - 45 INCH-POUNDS.** Install cotter pin, MS24665-153.

x.1. At quadrant arm, install long bushing in rod end and slot of quadrant arm. Install bolt (1 - 1/16 inch long), washers, and nut. **TORQUE NUT TO 13 - 23 INCH-POUNDS.** Install cotter pin, MS24665-153.

y. In tail cone, connect cable quick-disconnects and lockwire, Item 199, Appendix D (Figure 11-132, Sheet 1, Detail B).

z. Turn on power or run APU (PARA 1-6.3).

aa. At tail rotor quadrant, adjust adjusting nuts on each microswitch to move switch away from quadrant arm. TAIL ROTOR QUADRANT light on caution/advisory panel should go on. Adjust nuts so microswitch will move toward quadrant arm until TAIL ROTOR QUADRANT light on caution/advisory panel goes out. tighten nuts and lockwire, Item 198 Appendix D.

ab. Turn off electrical power.

ac. Check area for cleanness and absence of foreign material.

ad. Install tail gear box forward fairing.

ae. Install access panel on tailcone.

af. Do operational check of tail rotor quadrant (TM 55-1520-237-T).

11-30.1 REPLACE TAIL ROTOR QUADRANT 11-30.1

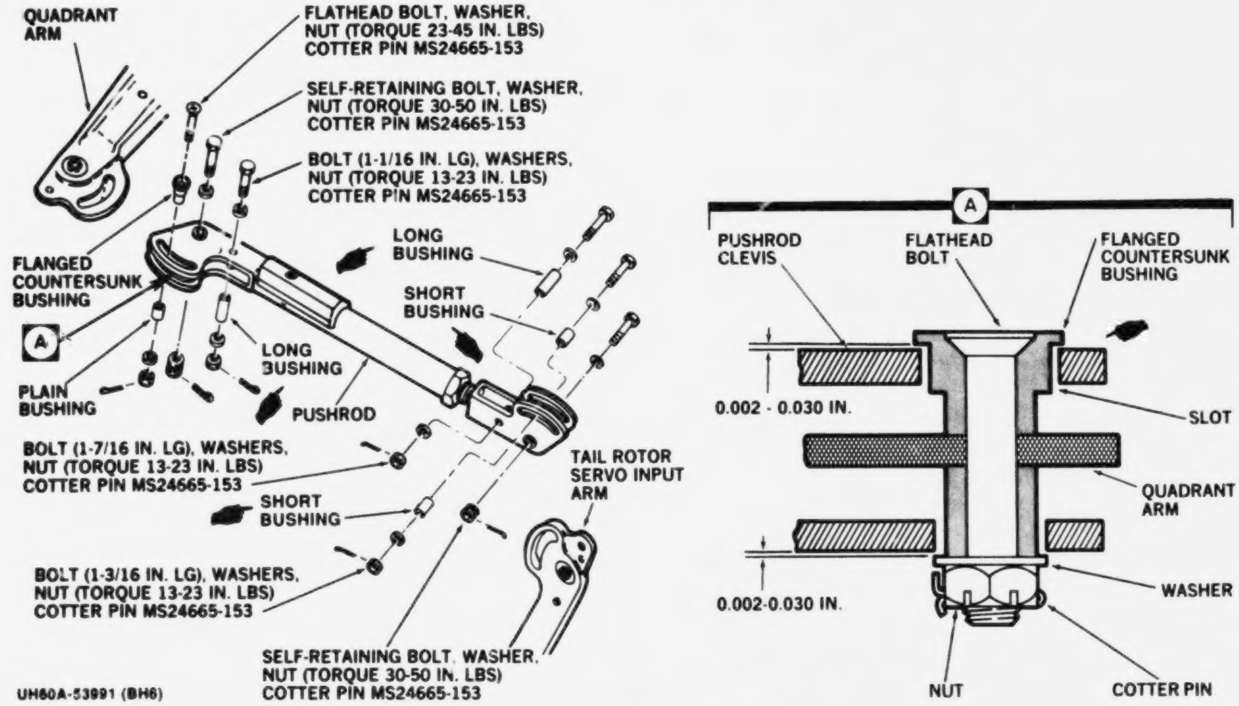

QUADRANT ARM
FLATHEAD BOLT, WASHER, NUT (TORQUE 23-45 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
BOLT (1-1/16 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
LONG BUSHING
SHORT BUSHING
FLANGED COUNTERSUNK BUSHING
A
LONG BUSHING
PLAIN BUSHING
PUSHROD
BOLT (1-7/16 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
TAIL ROTOR SERVO INPUT ARM
SHORT BUSHING
BOLT (1-3/16 IN. LG), WASHERS, NUT (TORQUE 13-23 IN. LBS) COTTER PIN MS24665-153
SELF-RETAINING BOLT, WASHER, NUT (TORQUE 30-50 IN. LBS) COTTER PIN MS24665-153
UH60A-53991 (BH6)
A
PUSHROD CLEVIS
FLATHEAD BOLT
FLANGED COUNTERSUNK BUSHING
0.002 - 0.030 IN.
SLOT
QUADRANT ARM
WASHER
0.002-0.030 IN.
NUT
COTTER PIN

FIGURE 11-133

11-30.2 REPLACE TAIL ROTOR QUADRANT SUPPORT 11-30.2

REMOVE

a. Remove tail rotor quadrant (PARA 11-30.1).

b. Remove screws and quadrant support (Figure 11-134).

INSTALL

WARNING

FLIGHT SAFETY PART

Verification of nut and screw installation, torque and safety installation are critical characteristics.

c. Install quadrant support with new self-locking screws. **TORQUE SCREWS TO 105 - 115 INCH-POUNDS.** Apply slippage mark.

d. Install tail rotor quadrant (PARA 11-30.1).

e. Remove tail rotor quadrant (PARA 11-30.1).

f. Remove upper and lower arms from quadrant with toggles and spring cylinders attached.

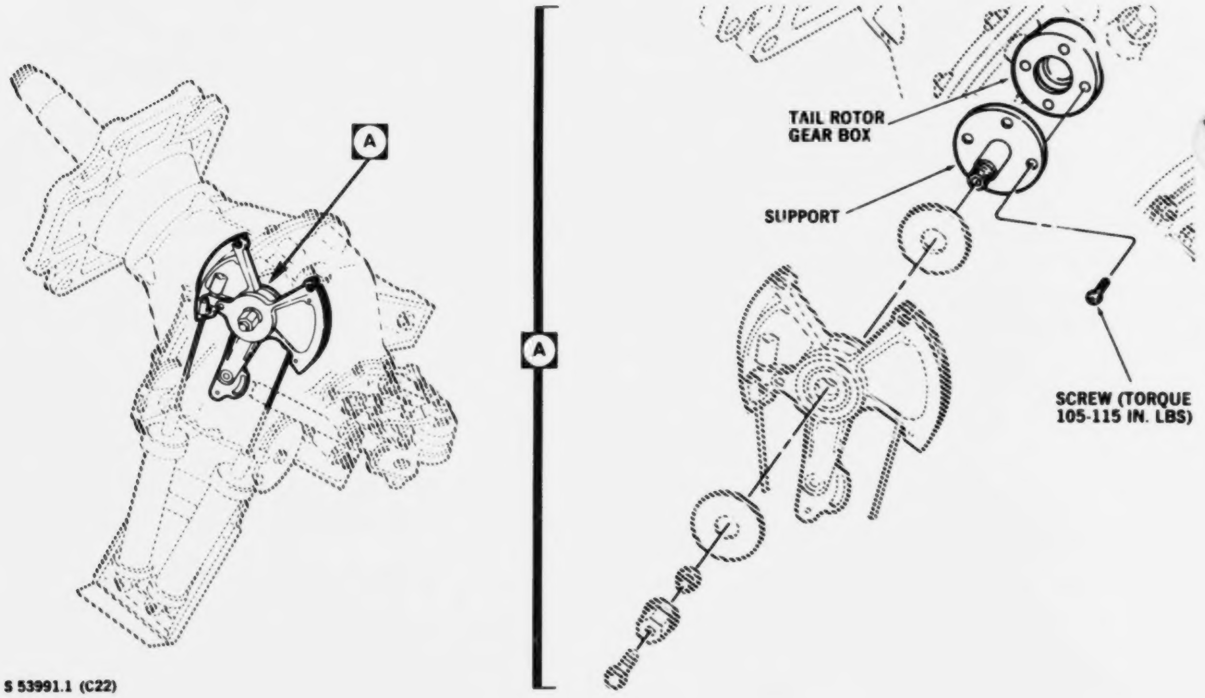

A
A
TAIL ROTOR GEAR BOX
SUPPORT
SCREW (TORQUE 105-115 IN. LBS)
S 53991.1 (C22)

FIGURE 11-134

11-30.2 REPLACE TAIL ROTOR QUADRANT SUPPORT 11-30.2

NOTE

The maximum wear or damage to clevises due to mounting brackets cannot exceed 0.030 inch metal removal. Replace capsule if clevis exceeds limits.

g. Using a No. 32 (0.116) drill, drill heads off rivets and punch rivets from toggle arms and clevises. Remove spacers. Remove spring cylinder clevis from toggle. Remove toggle from arm. Remove rings.

WARNING

FLIGHT SAFETY PART

Verification of toggle installation is a critical characteristic.

h. Install replacement toggle in arm clevis. Install ring on each side of toggle. Install spacer and rivet, MS20613-4C10.

i. Install spring cylinder clevis on toggle. Install spacer. Install rivet, MS20613-4C16.

j. Install upper and lower arms on quadrant hub. At same time, position toggle in mating recess in quadrant.

k. Install quadrant on tail gear box and support (PARA 11-30.1)

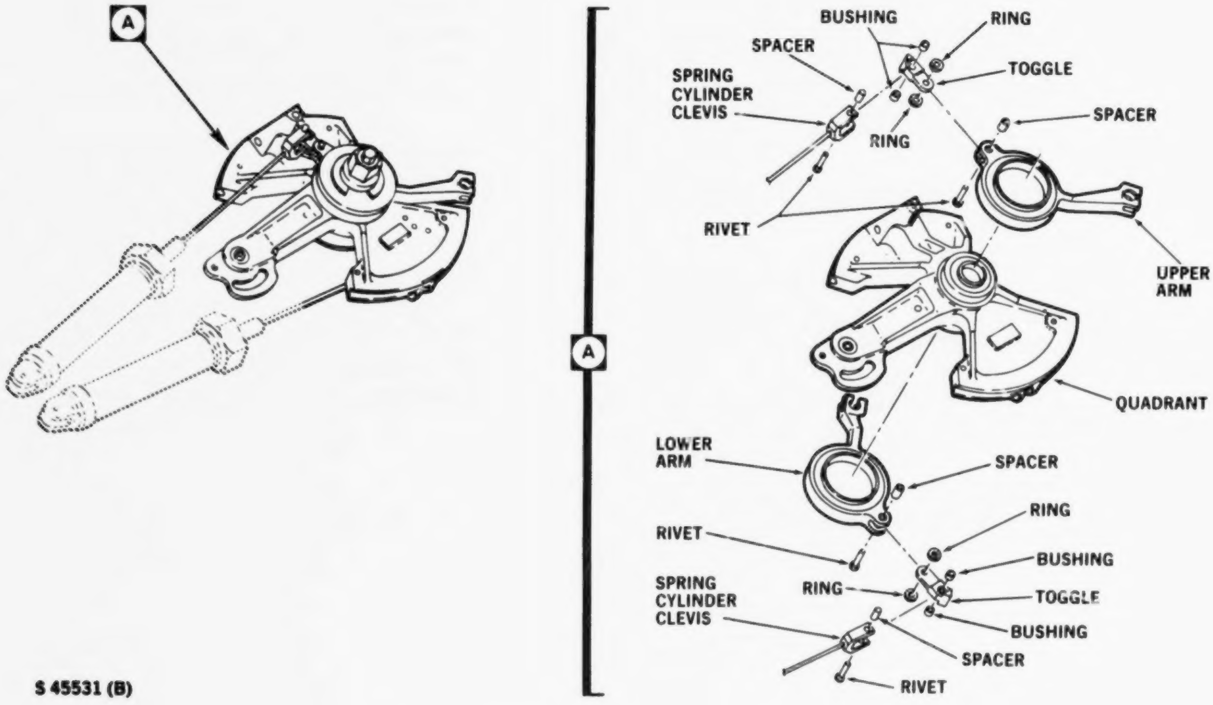

A
BUSHING
RING
SPACER
TOGGLE
SPRING
CYLINDER
CLEVIS
SPACER
RING
RIVET
UPPER
ARM
A
QUADRANT
LOWER
ARM
SPACER
RING
RIVET
BUSHING
SPRING
CYLINDER
CLEVIS
RING
TOGGLE
BUSHING
SPACER
RIVET
S 45531 (B)

FIGURE 11-135

11-30.3 TAIL ROTOR QUADRANT FUNCTIONAL CHECK 11-30.3

a. Remove tail rotor front fairing (PARA 2-56).

b. Remove left and right side pylon fold access panels.

c. Open main rotor pylon sliding cover.

d. Turn on hydraulic and electrical power or run APU (PARA 1-6.3).

e. Press BOOST ON on the AUTO FLIGHT CONTROL panel.

f. Install rigging pins in pitch, roll, yaw, and collective upper torque shafts (PARA 11-2).

g. Tie a length of cord to left control cable with knots in front and behind cable disconnect.

WARNING

To prevent personal injury or damage to equipment, cable quick-disconnect ends must be restrained prior to cable separation. Quadrant spring capsules maintain 51 to 223 pounds tension on cables.

h. Unscrew cable disconnect jamnut until cable separates.

i. Visually check tail rotor servo quadrant right toggle and spring capsule. Toggle will be disengaged and spring relaxed.

j. Check that CAUTION ADVISORY panel TAIL ROTOR capsule light is on.

k. Disconnect tail rotor quadrant right spring capsule from support.

WARNING

FLIGHT SAFETY PART

Verification of toggle installation is a critical characteristic.

l. Install toggle in quadrant notch.

m. Connect cable quick-disconnect. **TORQUE JAMNUT TO 40 - 60 INCH-POUNDS.** Lockwire, item 199, Appendix D, jamnut. Remove cable restraint cord.

n. Remove rigging pins installed in pitch, roll, yaw, and collective upper torque shafts.

o. Have assistant hold high collective, left pedal, and mid-cyclic. Connect right spring capsule to pylon structure. Check CAUTION ADVISORY panel TAIL ROTOR capsule light is off.

p. Inspect left cable at each pulley installation to make sure cable rests in pulley grooves.

q. Install rigging pins in pitch, roll, yaw, and collective upper torque shafts.

r. Install a length of strong cord on right cable with knots in front and behind quick-disconnect hardware.

11-30.3 TAIL ROTOR QUADRANT FUNCTIONAL CHECK 11-30.3

WARNING

To prevent personal injury or damage to equipment, cable quick-disconnect ends must be restrained prior to cable separation. Quadrant spring capsules maintain 51 to 223 pounds tension on cable.

s. Unscrew cable disconnect jamnut until cable separates.

t. Check left toggle and spring capsule. Toggle will be disengaged and spring cylinder will be relaxed.

u. Check CAUTION ADVISORY panel TAIL ROTOR capsule light is on.

v. Disconnect left spring capsule from support.

WARNING

FLIGHT SAFETY PART

Verification of toggle installation is a critical characteristic.

w. Install toggle in quadrant notch.

x. Connect cable quick-disconnect. **TORQUE JAMNUT TO 40 - 60 INCH-POUNDS.** Lockwire, Item 199, Appendix D, jamnut. Remove cord.

y. Remove pitch, roll, yaw, and collective torque shaft rigging pins.

z. Have an assistant hold low collective, right pedal, and mid-cyclic. Connect left spring capsule to pylon structure.

aa. Check CAUTION ADVISORY panel, TAIL ROTOR capsule light is off.

ab. Inspect right cable at each pulley installation to make sure cable rests in pulley grooves.

ac. On AUTO FLIGHT CONTROL panel, press SAS 1 switch - ON. Press SAS 2, TRIM, and FPS switches - OFF.

ad. Attach a spring scale to pilot's pedals. Force required to move pedals left and right through full range of travel shall not be more than 4 pounds.

ae. If pedals need more than 4 pounds to be moved, check each pulley installation for correct cable routing and cable guard installation. Repair cable system, as required.

af. Do a tail rotor rig check (PARA 11-2).

ag. Do an operational check of tail rotor control system (TM 55-1520-237-T).

ah. On AUTO FLIGHT CONTROL panel, press SAS 1 and BOOST switches off.

ai. Turn off all electrical and hydraulic power.

aj. Check area for cleanness and foreign material before closing area.

ak. Install tail rotor gear box fairings (PARA 2-56).

al. Do a maintenance test flight (TM 55-1520-237-MTF).

11-30.4 REPLACE SPRING CYLINDERS 11-30.4

REMOVE

a. Remove quadrant from tail gear box (PARA 11-30.1).

b. Remove spring cylinder from toggle by removing rivet and spacer (PARA 11-30.2).

c. If either washer has become unbonded from clevis, do this:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Use a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D, clean area on clevis where washer is to be bonded.

(2) Using abrasive cloth, Item 1, Appendix D, lightly scuff side of washer.

(3) Apply a light coat of adhesive, Item, 404, Appendix D, to scuffed side of washer and on clevis.

(4) Install washer on clevis.

(5) Allow adhesive, Item 404, Appendix D, to air-dry for 2 hours before handling.

INSTALL

d. Rivet replacement spring cylinder to toggle (PARA 11-30.2).

e. Install quadrant on tail gear box (PARA 11-30.1).

11-31 TAIL ROTOR QUADRANT - REPAIR (AVIM) 11-31

PARAGRAPH BREAKDOWN

11-31.1	REPLACE BEARINGS IN QUADRANT (AVIM)
11-31.2	REPLACE BEARING IN UPPER/LOWER ARMS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant
- One: MOS 68D - Aircraft Powertrain Repairer

MATERIALS/PARTS

- Degreasing Solvent, Item 131, Appendix D
- Loctite, Item 398, Appendix D
- Loctite, Grade B, Item 208, Appendix D
- Primer, Item 277, Appendix D
- Stripper, Item 331, Appendix D
- Surface Primer, Grade T, Item 333, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Arbor Press, OO-P-636
- Bolt, 1/4-inch diameter (3/4 inch long)
- Bolt, 1/4-inch diameter (2-1/4 inch long)
- Dial Indicator, MIL-I-18422
- Fluorescent Penetrant Inspection Kit, XMA101
- Powertrain Repairer's Toolkit, SC 5180-99-CL A13
- Torque Wrench, 0 - 16 in. oz, TQSS008A
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686

REFERENCES

- PARA 11-31
- TM 55 1500-335-23

11-31.1 REPLACE BEARINGS IN QUADRANT (AVIM) 11-31.1

INSPECT

a. Inspect bearings, in quadrant using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005-INCH.**

REMOVE

b. Using an arbor press and step-type pusher, press all bearings and spacer from quadrant.

c. Strip paint from surface of part around bearing holes, and around hub, using stripper, Item 333, Appendix D.

d. Do a fluorescent penetrant inspection of quadrant (TM 55-1500-335-23).

e. Coat paint-stripped areas with primer, Item 277, Appendix D. Touch up primer areas with paint.

INSTALL

CAUTION

To prevent damage to quadrant, do not get degreasing solvent in bearings.

f. Clean bearing surfaces of quadrant and outside diameter of bearings with degreasing solvent, Item 131, Appendix D.

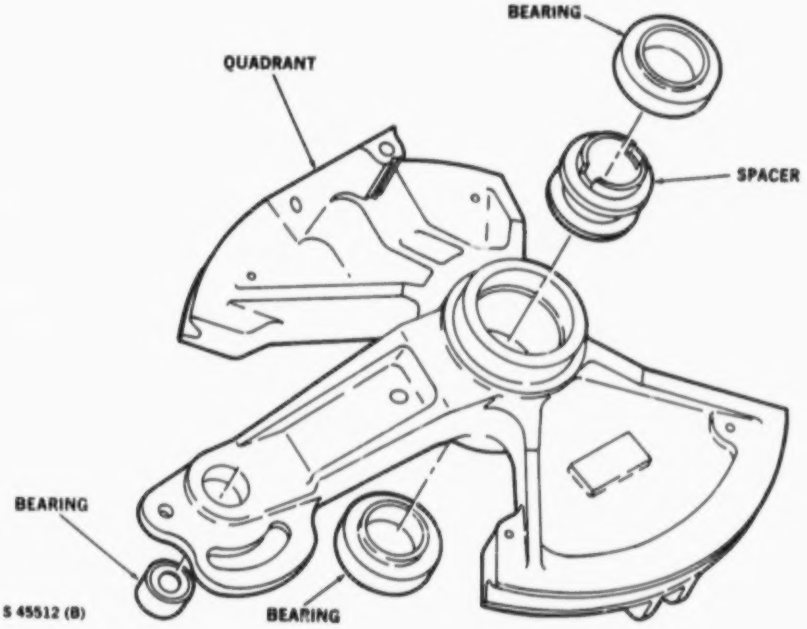


FIGURE 11-136

11-31.1 REPLACE BEARINGS IN QUADRANT (AVIM) 11-31.1

NOTE

Surface primer and loctite must be made by same manufacturer.

CAUTION

To prevent damage to bearings, do not get primer on support bearing bore surface.

g. Apply a light coat of surface primer, Item 333, Appendix D, to outside diameters of bearings. Allow to air-dry for at least 30 seconds.

h. Apply about a 1/16-inch bead of loctite, Item 398, Appendix D, to leading edge of bearings outside diameters and entrance edge of bearing bore in quadrant. Bead should be all around edges.

i. Within 10 minutes after applying loctite, press bearings into quadrant.

j. Press small bearing into quadrant arm. Press one large bearing into quadrant. In other side, install spacer and washers. Press in large bearing. Be careful not to get loctite in bearings.

k. Using a cloth damp with solvent, Item 131, Appendix D, wipe surfaces of bearings clean of any loctite. Be careful not to get solvent in bearings.

l. Allow at least 10 minutes for loctite to dry before handling quadrant.

NOTE

Loctite exposed to air (external to mating surfaces) will not dry.

m. Do a rotational drag check of all bearings as follows:

(1) Install a 1/4- by 3/4-inch-long bolt through small bearing. Secure with nut.

(2) Using a torque wrench, and socket, turn bolt head and measure rotational drag of bearing.

(3) If drag is more than 10 inch-ounces, replace bearings.

(4) Remove bolt from crank.

11-31.2 REPLACE BEARINGS IN UPPER/LOWER ARMS (AVIM) 11-31.2

INSPECT

a. Inspect bearing, in arm using dial indicator. **MAXIMUM ALLOWABLE RADIAL PLAY IS 0.005-INCH.**

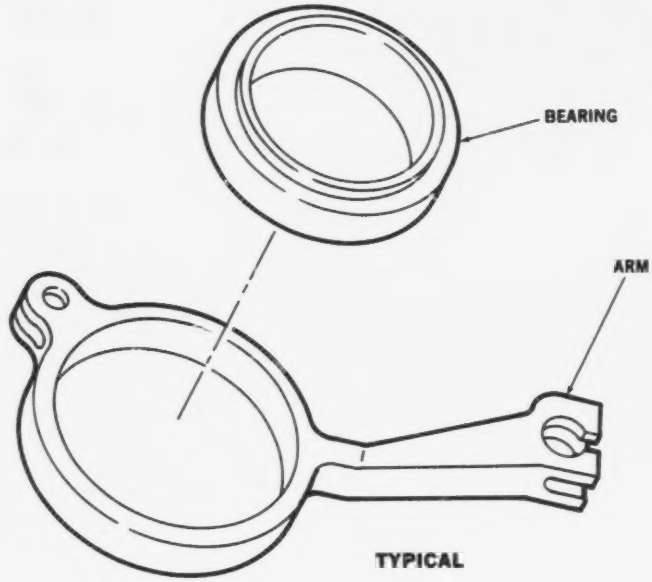
REMOVE

b. Using an arbor press and step-type pusher, press bearing from arm.

c. Strip paint from surface of part around bearing hub and clevises, using stripper, Item 331, Appendix D.

d. Do a fluorescent penetrant inspection of arm (TM 55-1500-335-23).

e. Coat paint-stripped areas with primer, Item 277, Appendix D. Touch up primer areas with paint.



S 45604 (B)

FIGURE 11-137

11-31.2 REPLACE BEARINGS IN UPPER/LOWER ARMS (AVIM) 11-31.2

INSTALL

CAUTION

Do not get solvent in bearing.

d. Clean bearing surfaces of arm and outside diameter of bearings with degreasing solvent, Item 131, Appendix D.

NOTE

Surface primer and loctite must be made by same manufacturer.

CAUTION

Do not get primer in bearing.

e. Apply a light coat of surface primer, Item 333, Appendix D, to outside diameter of bearing and inside diameter of arm. Allow to air-dry for at least 30 minutes.

f. Apply about a 1/16-inch bead of loctite, Item 398, Appendix D to leading edge of bearing outside diameter and entrance edge of bearing bore in arm. Bead should be all around edge.

g. Within 10 minutes after applying loctite, press bearing into quadrant. Be careful not to get loctite in bearing.

h. Using a cloth damp with solvent, Item 131, Appendix D, wipe surfaces of bearing clean of any surface primer. Be careful not to get solvent in bearing.

i. Allow at least 10 minutes for loctite to dry before handling arm.

NOTE

Loctite exposed to air (external to mating surfaces) will not dry.

j. Do a rotational drag check of bearing as follows:

(1) Make two 1/8- by 2-1/4-inch diameter steel washers.

(2) Drill 1/4-inch hole through center of each washer.

(3) Put washers on each side of bearing on center race.

(4) Install 1/4 by 1 inch long hexhead bolt and nut.

(5) Using a torque wrench and socket, turn bolt head and measure rotational drag of bearings.

(6) If drag is more than 24 inch-ounces, replace bearing.

(7) Remove bolt and washers from arm.

11-32 FLIGHT SAFETY PARTS 11-32

PARAGRAPH BREAKDOWN

11-32.1	INSPECTION/REPAIR FLIGHT SAFETY PARTS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Crocus Cloth, Item 128, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Fluorescent Penetrant Inspection Kit, XMA101

REFERENCES

- PARA 2-5
- TM 55 1500-335-23
- TM 55-1500-345-23

11-32.1 INSPECTION/REPAIR FLIGHT SAFETY PARTS 11-32.1

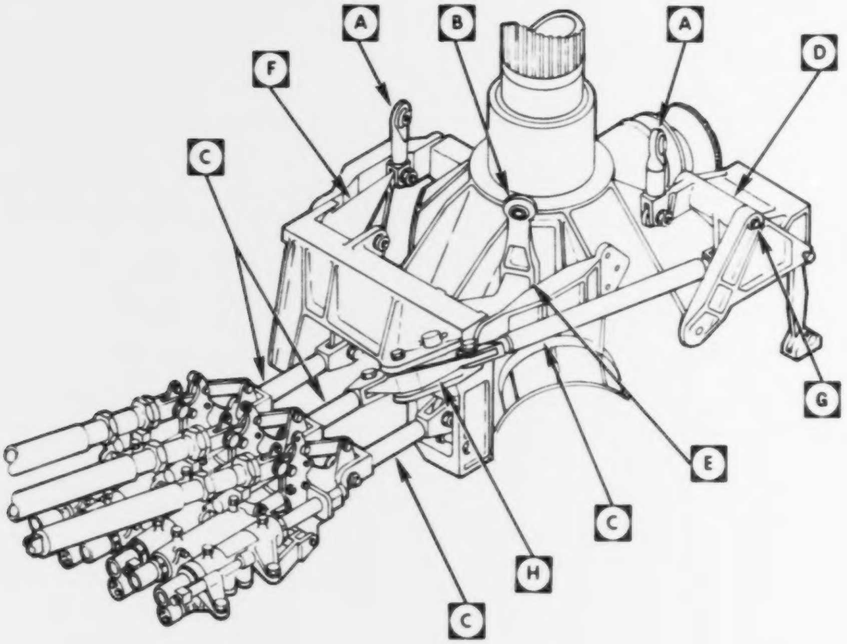
a. Visually inspect hatched area of parts for nicks, dents, scratches, and tool or scuff marks. Damage in paint or protective finishes not penetrating into base metal may be repaired with touch-up paint (PARA 2-5 and TM 55-1500-345-23). **REPLACE PART IF DAMAGE PENETRATES INTO BASE METAL.**

b. Check for surface damage on non-critical areas of part. Blend any damage found with 400-grit crocus cloth, Item 128, Appendix D. Keep blend depth to absolute minimum required to remove damage. **REPLACE PART IF DAMAGE IS DEEPER THAN 0.020 INCH AFTER BLENDING.**

c. Inspect reworked area for cracks using fluorescent penetrant inspection kit (TM 55-1500-335-23). **NO CRACKS ALLOWED.**

d. Touch-up finish all reworked areas (PARA 2-5 and TM 55-1500-345-23).

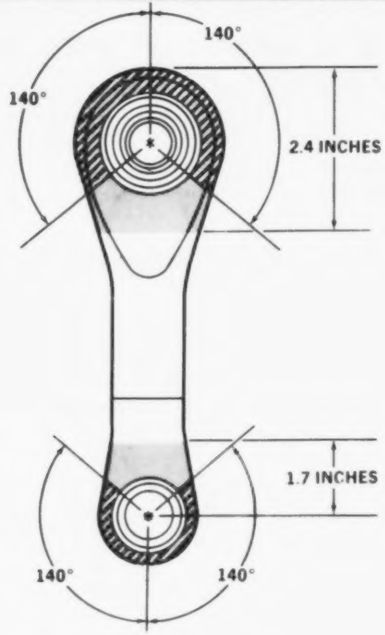
e. Visually inspect hatched area of special self-retaining bolts for nicks, dents, and scratches. **REPLACE BOLT IF DAMAGE IS FOUND.**



S 151101.1 (BH4)

FIGURE 11-138 (SHEET 1 OF 4)

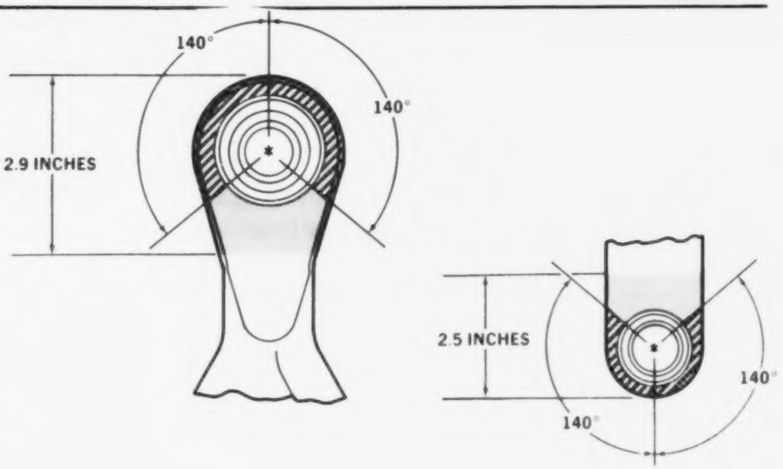
11-32.1 INSPECTION/REPAIR FLIGHT SAFETY PARTS 11-32.1


140°
140°
2.4 INCHES
1.7 INCHES
140°
140°

SHADED ZONES CONTAIN
CRITICAL CHARACTERISTICS.
CRITICAL CHARACTERISTIC AREAS
SHOWN IN HATCHED AREA.

FORWARD AND AFT LINK

A

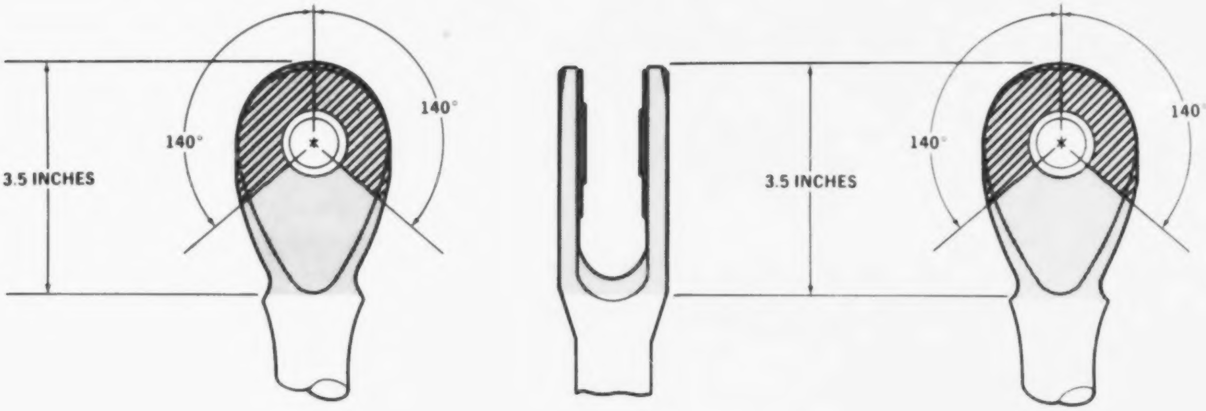

140°
140°
2.9 INCHES
2.5 INCHES
140°
140°

SHADED ZONES CONTAIN
CRITICAL CHARACTERISTICS.
CRITICAL CHARACTERISTIC AREAS
SHOWN IN HATCHED AREA.

LATERAL LINK

B

C

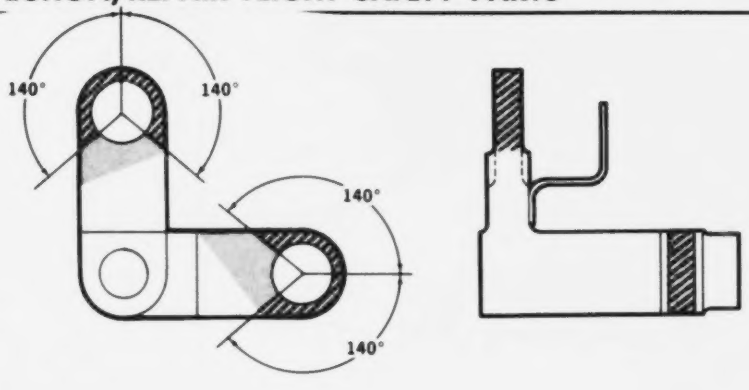

3.5 INCHES
140°
140°
3.5 INCHES
140°
140°

SHADED ZONES CONTAIN
CRITICAL CHARACTERISTICS.
CRITICAL CHARACTERISTIC AREAS
SHOWN IN HATCHED AREA.

CONTROL ROD (TYPICAL)
FIGURE 11-138 (SHEET 2 OF 4)

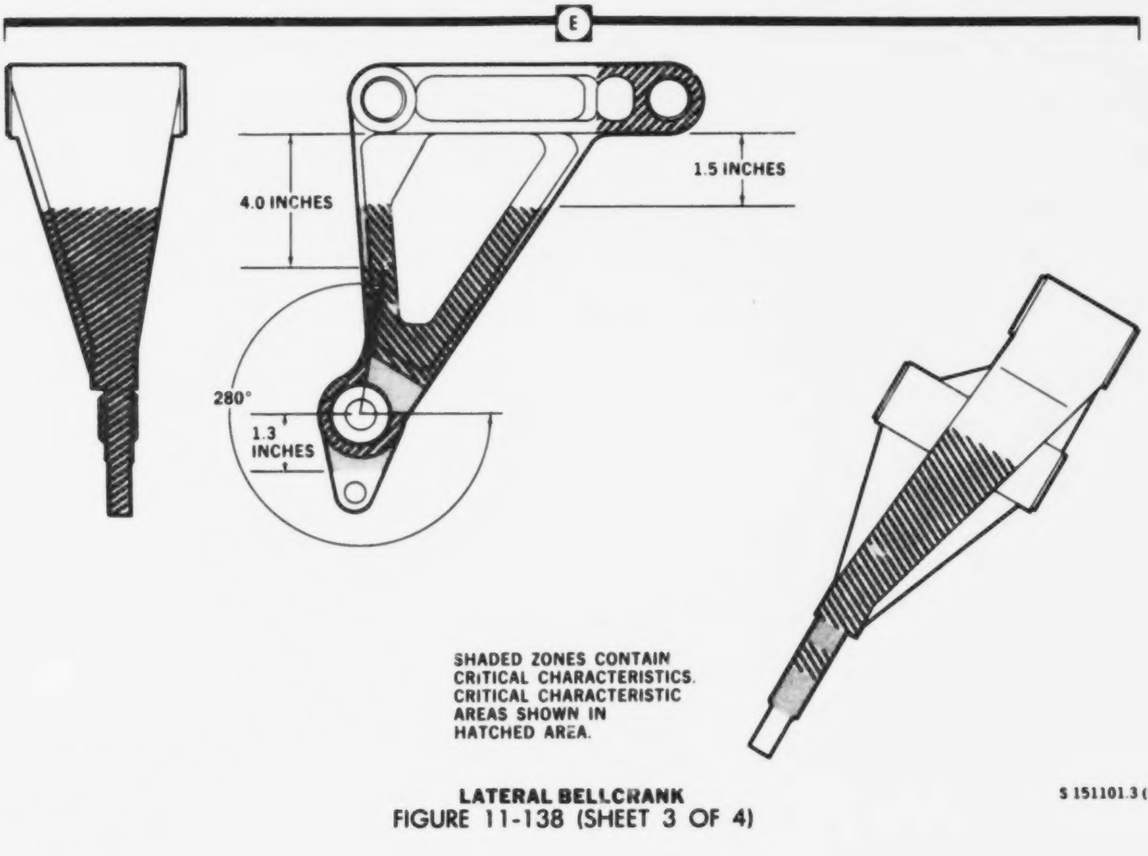
S 151101.2 (BH4)

11-32.1 INSPECTION/REPAIR FLIGHT SAFETY PARTS 11-32.1


140°
140°
140°
140°
D

SHADED ZONES CONTAIN CRITICAL CHARACTERISTICS. CRITICAL CHARACTERISTIC AREAS SHOWN IN HATCHED AREA.

AFT BELLCRANK

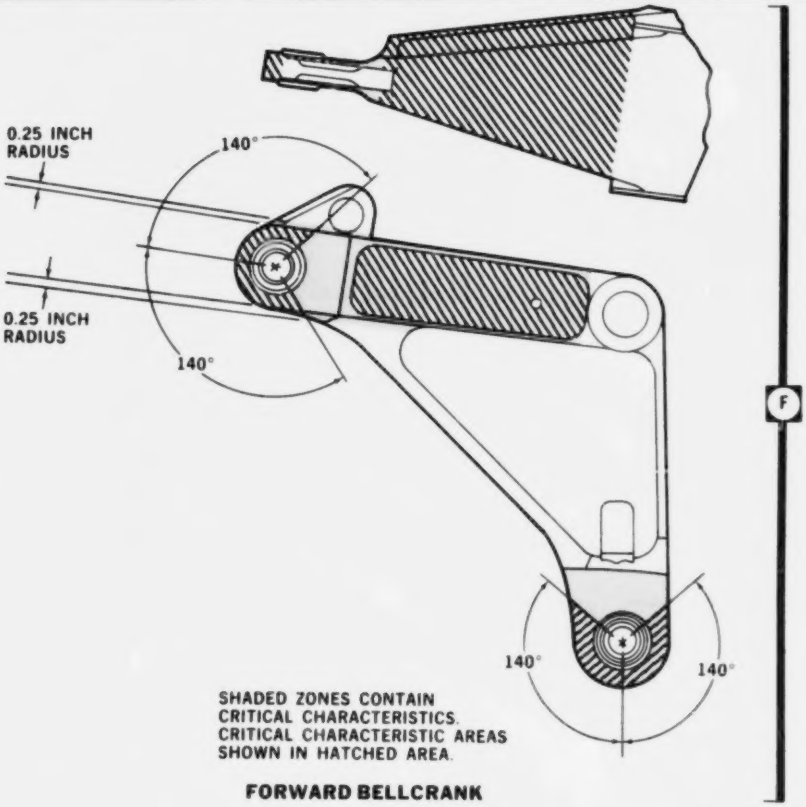

E
4.0 INCHES
1.5 INCHES
280°
1.3 INCHES

SHADED ZONES CONTAIN CRITICAL CHARACTERISTICS. CRITICAL CHARACTERISTIC AREAS SHOWN IN HATCHED AREA.

LATERAL BELLCRANK
FIGURE 11-138 (SHEET 3 OF 4)

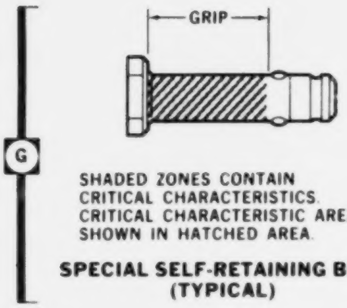
S 151101.3 (BH4)

11-32.1 INSPECTION/REPAIR FLIGHT SAFETY PARTS 11-32.1


0.25 INCH RADIUS
140°
0.25 INCH RADIUS
140°
F
140°
140°

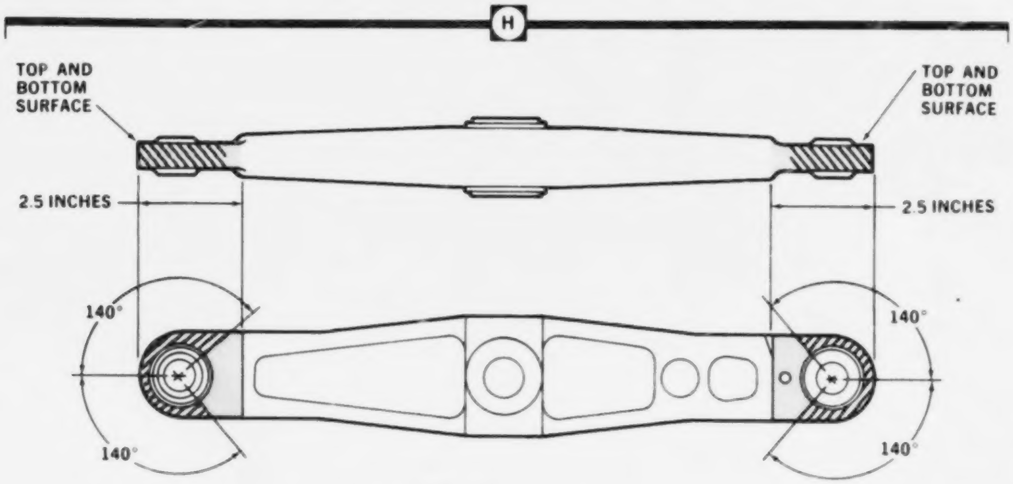
SHADED ZONES CONTAIN CRITICAL CHARACTERISTICS. CRITICAL CHARACTERISTIC AREAS SHOWN IN HATCHED AREA.

FORWARD BELLCRANK



SHADED ZONES CONTAIN CRITICAL CHARACTERISTICS. CRITICAL CHARACTERISTIC AREAS SHOWN IN HATCHED AREA.

SPECIAL SELF-RETAINING BOLT (TYPICAL)


H
TOP AND BOTTOM SURFACE
TOP AND BOTTOM SURFACE
2.5 INCHES
2.5 INCHES
140°
140°
140°
140°

SHADED ZONES CONTAIN CRITICAL CHARACTERISTICS. CRITICAL CHARACTERISTIC AREAS SHOWN IN HATCHED AREA.

WALKING BEAM

FIGURE 11-138 (SHEET 4 OF 4)

S 151101.4 (BH4)

CHAPTER 12

UTILITY SYSTEM

CHAPTER OVERVIEW

PARAGRAPH	TITLE	PAGE
12-1	Fire Detection/Extinguishing System	12-2
12-2	Fire Detection/Extinguishing System	12-14
12-3	Windshield Wiper	12-25
12-4	Windshield Anti Ice System	12-42
12-5	Engine Air Inlet Anti Ice	12-45
12-6	Blade Deicing System	12-50
12-7	Blade Deice Test Panel (AVIM)	12-208

12-1 FIRE EXTINGUISHING SYSTEM 12-1

PARAGRAPH BREAKDOWN

12-1.1	REPLACE EXTINGUISHING AGENT CONTAINER
12-1.2	PRESERVE CONTAINER
12-1.3	REPLACE CARTRIDGE
12-1.4	REPLACE CHECK VALVE
12-1.5	REPLACE THERMAL DISC
12-1.6	REPLACE DISCHARGE TUBES
12-1.7	REPLACE DIRECTIONAL VALVE

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Antiseize Compound, Item 78, Appendix D
- Lockwire, Item 199, Appendix D
- Packing, MS28778-5

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Open End Wrench, 1-1/16 x 1-1/4-inch, GGG-W-636
- Protective Caps and Plugs
- Spring Scale, AAA-S-133
- Tags
- Torque Wrench, 0 - 30 in. lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686

REFERENCES

- PARA 1-8.1
- TM 55-1500-204-25/1
- TM 55-1500-323-24
- TM 55-1520-237-T

12-1.1 REPLACE EXTINGUISHING AGENT CONTAINER 12-1.1

REMOVE

NOTE

The following procedures apply to both main and reserve containers.

a. Turn off all electrical power.

b. Open APU compartment door on right side of helicopter.

c. Disconnect electrical wiring from cartridge on either discharge outlet. Tag manifold tube to discharge outlet with same identification as removed wiring.

WARNING

Injury to personnel and damage to equipment will result if cartridge does not have a shorting jumper installed before being removed. Cartridge could detonate. Make sure shorting jumper is installed before removing cartridge.

d. Connect shorting jumper between cartridge power and ground terminals.

e. Disconnect wiring from cartridge on other discharge outlet, and tag manifold tube in same manner.

WARNING

Injury to personnel and damage to equipment will result if cartridge does not have a shorting jumper installed before being removed. Cartridge could detonate. Make sure shorting jumper is installed before removing cartridge.

f. Connect shorting jumper between cartridge power and ground terminals.

WARNING

To prevent injury to personnel or damage to equipment, do not loosen fill/relief or discharge outlet valves if container is pressurized.

g. Disconnect overboard discharge tube from container fill/thermal relief outlet. Plug tube.

h. Disconnect manifold tubes from container discharge outlets. Plug tubes.

i. Unbolt and remove container from support. Cap discharge outlets and fill/thermal relief outlet.

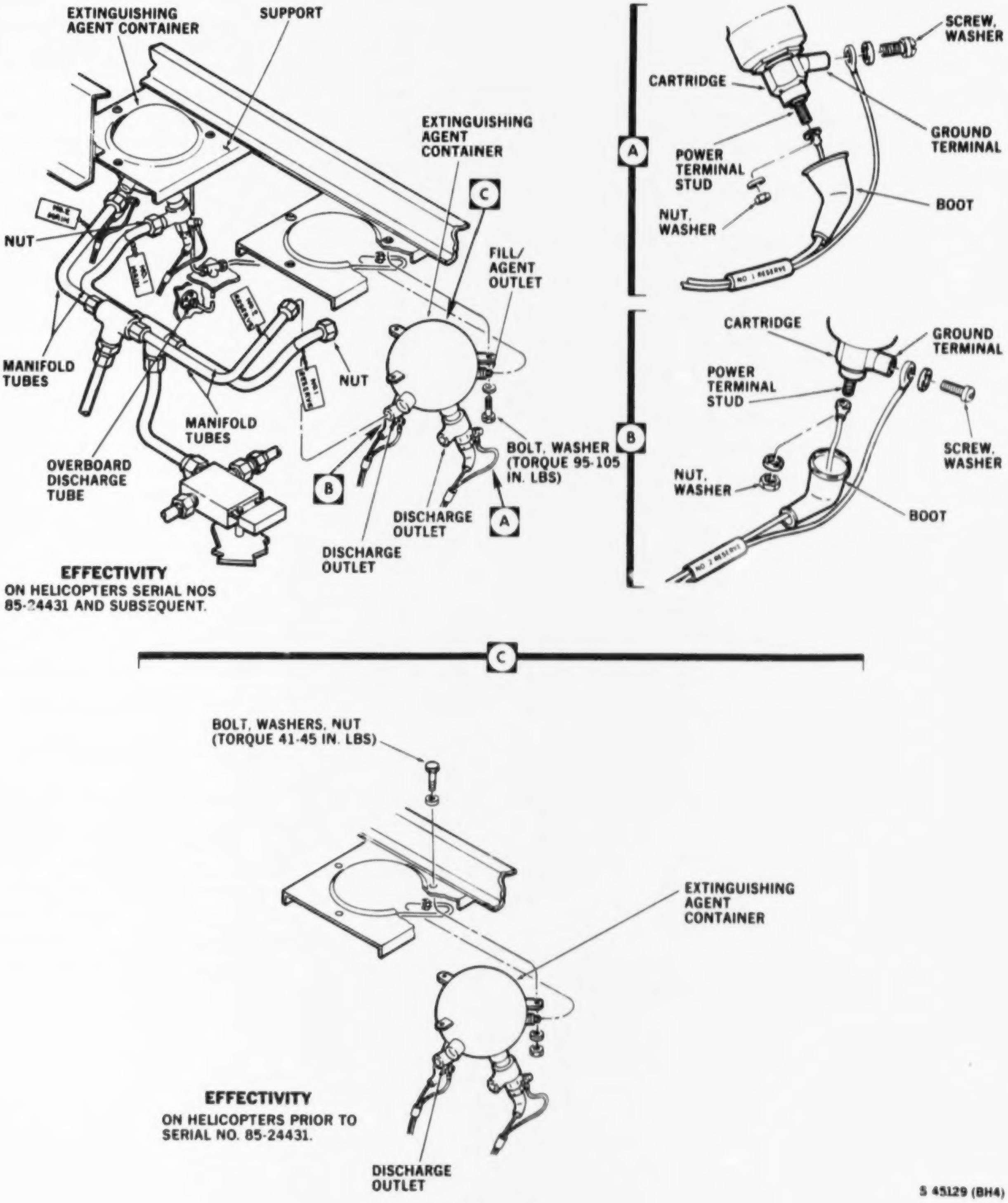
j. Preserve container (PARA 12-1.2).

INSTALL

k. Install new cartridges (PARA 12-1.3).

l. Using spring scale, weigh container with discharge outlets and cartridges installed. **WEIGHT WITH EXTINGUISHING AGENT AND CHARGES SHOULD NOT DIFFER MORE THAN 0.05 POUNDS FROM THAT ON DECAL (5.90 POUNDS MAXIMUM WEIGHT) WHEN LAST CHARGED.** If gage pressure or weight is below limits specified on decal, replace container.

12-1.1 REPLACE EXTINGUISHING AGENT CONTAINER 12-1.1


EXTINGUISHING AGENT CONTAINER
SUPPORT
EXTINGUISHING AGENT CONTAINER
C
NUT
FILL/ AGENT OUTLET
MANIFOLD TUBES
NUT
MANIFOLD TUBES
OVERBOARD DISCHARGE TUBE
BOLT, WASHER (TORQUE 95-105 IN. LBS)
B
DISCHARGE OUTLET
A
DISCHARGE OUTLET
A
CARTRIDGE
SCREW, WASHER
GROUND TERMINAL
POWER TERMINAL STUD
BOOT
NUT, WASHER
NO 1 RESERVE
B
CARTRIDGE
GROUND TERMINAL
POWER TERMINAL STUD
SCREW, WASHER
NUT, WASHER
BOOT
NO 2 RESERVE
C
BOLT, WASHERS, NUT (TORQUE 41-45 IN. LBS)
EXTINGUISHING AGENT CONTAINER
DISCHARGE OUTLET

EFFECTIVITY
ON HELICOPTERS SERIAL NOS 85-24431 AND SUBSEQUENT.

EFFECTIVITY
ON HELICOPTERS PRIOR TO SERIAL NO. 85-24431.

S 45129 (BH4)

FIGURE 12-1

12-1.1 REPLACE EXTINGUISHING AGENT CONTAINER 12-1.1

m. Turn off all electrical power.

n. On helicopters serial Nos 85-24431 and subsequent, bolt container to nut plates on support with bolts and washers. **TORQUE BOLTS TO 95 - 105 INCH-POUNDS.**

o. On helicopters prior to serial No. 85-24431, bolt container to support with bolts, washers, and nuts. **TORQUE BOLTS TO 41 - 45 INCH-POUNDS.**

p. Remove caps from container.

q. Coat threads on container discharge outlets with antiseize compound, Item 78, Appendix D.

r. Unplug and connect manifold tubes to container discharge outlets.

s. Unplug and connect overboard discharge tube to container.

t. Do an operational check of fire extinguishing system (TM 55-1520-237-T).

u. Remove shorting jumper between cartridge power and ground terminals.

WARNING

To make certain electrical wires are not crossed, refer to TM 55-1520-237-T.

v. Match No. 1 MAIN or No. 1 RESERVE electrical wiring to manifold tube tagged with same identification. Connect braided wire to cartridge power terminal stud and install boot. Connect ground wire to ground terminal with screw and washer.

w. Remove shorting jumper between cartridge power and ground terminals.

x. Connect No. 2 MAIN or No. 2 RESERVE electrical wiring to cartridge in same manner used for No. 1.

y. Remove tags from manifold tubes.

z. Make sure compartment area is free of foreign objects.

aa. Close and latch APU compartment door.

12-1.2 PRESERVE CONTAINER 12-1.2

PRESERVE

a. Remove container from helicopter.

WARNING

To prevent accidental discharge causing injury to personnel or damage to equipment, make sure cartridge is removed from extinguishing container prior to packing.

b. Remove cartridge from container (PARA 12-1.3).

c. Cap main and thermal fittings on container.

d. Plug firing cartridge hole.

e. Pack in carton large enough to allow for 1 inch of cushioning around container.

12-1.3 REPLACE CARTRIDGE 12-1.3

REMOVE

NOTE

The following procedures apply to all four cartridges in the fire extinguishing system.

a. Turn off all electrical power.

b. Open APU compartment door on right side of helicopter.

c. Disconnect electrical wiring from cartridge terminals.

WARNING

Injury to personnel and damage to equipment will result if cartridge does not have a shorting jumper installed before being removed. Cartridge could detonate. Make sure shorting jumper is installed before removing cartridge.

d. Connect shorting jumper between cartridge power terminal stud and ground terminal.

WARNING

To prevent injury to personnel or damage to equipment, do not remove lockwire from cartridge housing assembly if container is pressurized.

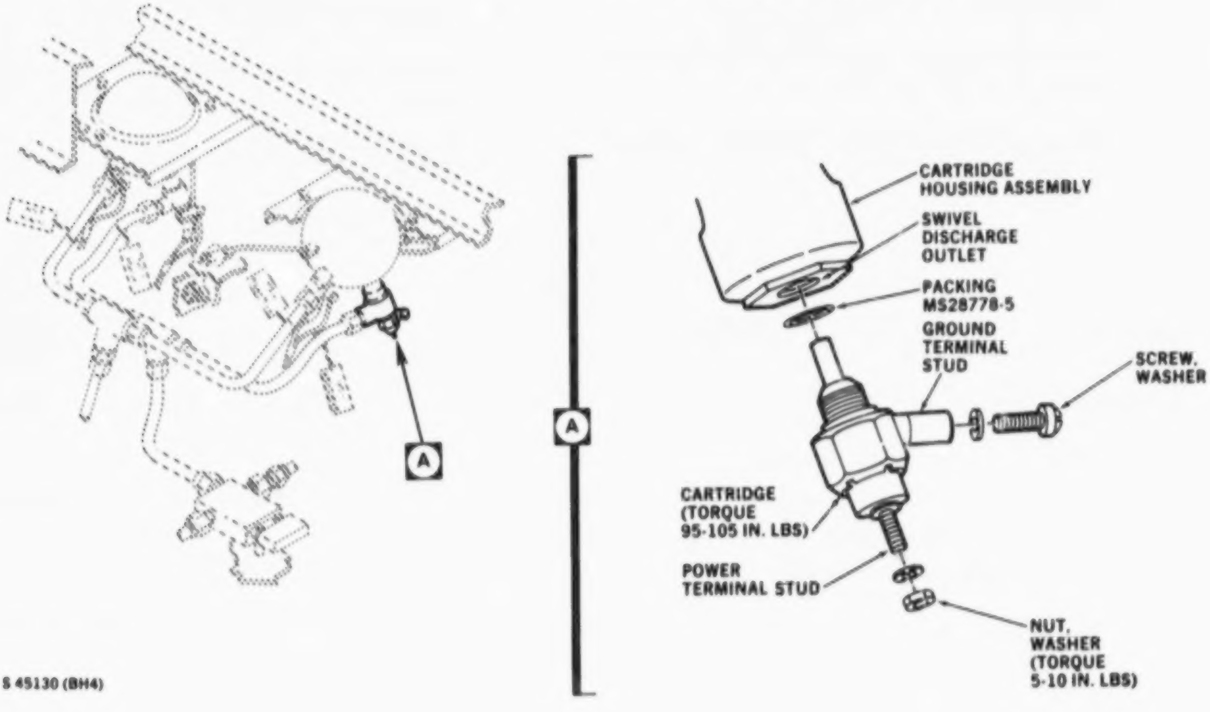

A
A
CARTRIDGE HOUSING ASSEMBLY
SWIVEL DISCHARGE OUTLET
PACKING MS28778-5
GROUND TERMINAL STUD
SCREW, WASHER
CARTRIDGE (TORQUE 95-105 IN. LBS)
POWER TERMINAL STUD
NUT, WASHER (TORQUE 5-10 IN. LBS)
S 45130 (BH4)

FIGURE 12-2

12-1.3 REPLACE CARTRIDGE 12-1.3

e. Hold housing assembly with open end wrench and remove cartridge without loosening housing assembly.

f. Inspect electrical wiring for fraying, security, and general condition. Replace wiring if necessary (TM 55-1500-323-24).

INSTALL

g. Turn off all electrical power.

WARNING

- To prevent injury to personnel or damage to equipment, do not remove protective cover until after cartridge has been installed in housing assembly of fire extinguisher container.
- To prevent injury to personnel or damage to equipment, use cartridge, 70310-03101-105, with fire extinguisher bottle, 70310-03101-106 or 70310-03101-101. Use cartridge, 70310-03101-107, with fire extinguisher bottle, 70310-03101-108 or 70310-03101-101.

h. Check cartridge for installation, manufacturing date, and serviceability (PARA 1-8.1).

i. Hold housing assembly with open end wrench.

j. Install new packing, MS28778-5, on serviceable cartridge.

k. Install cartridge in housing assembly on discharge outlet. **TORQUE TO 95 - 105 INCH-POUNDS.** Lockwire, Item 199, Appendix D, cartridge to housing assembly. Remove protective cover.

l. Do an operational check of fire extinguishing system (TM 55-1520-237-T).

m. Remove shorting jumper between cartridge power terminal and ground terminal.

WARNING

To make certain electrical wires are not crossed, refer to TM 55-1520-237-T.

n. Connect electrical wiring to cartridge terminals. **TORQUE NUT TO 5 - 10 INCH-POUNDS.**

o. Check area to be sure it is free of foreign objects, then close and latch APU compartment door.

12-1.4 REPLACE CHECK VALVE 12-1.4

REMOVE

NOTE

The following procedures apply to both check valves in the fire extinguishing system.

a. Turn off all electrical power.

b. Open APU compartment door on right side of helicopter.

c. Disconnect tubes from check valve. Plug tubes.

d. Remove nut and reducer from check valve.

INSTALL

e. Install reducer and nut on check valve. **TORQUE NUT TO 480 - 696 INCH-POUNDS.**

f. Unplug and connect tubes to check valve. **TIGHTEN 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

g. Check area to be sure it is free of foreign objects, then close and latch APU compartment door.

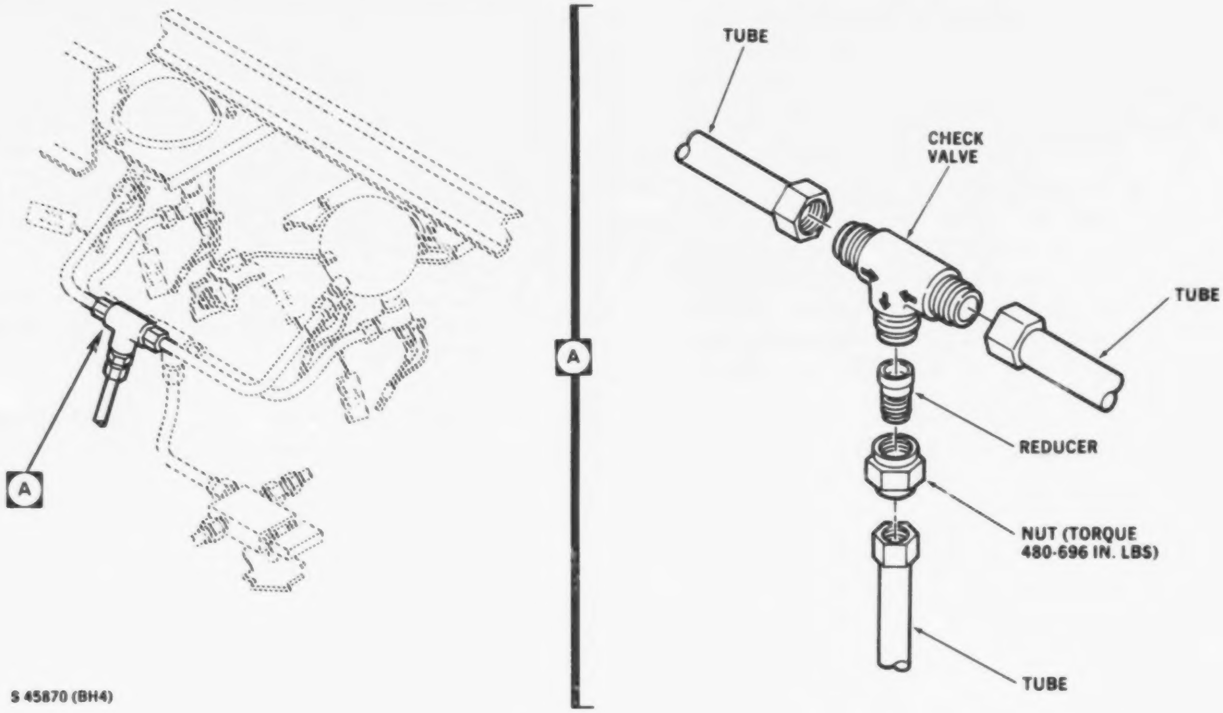

A
A
TUBE
CHECK VALVE
TUBE
REDUCER
NUT (TORQUE 480-696 IN. LBS)
TUBE
S 45870 (BH4)

FIGURE 12-3

12-1.5 REPLACE THERMAL DISC 12-1.5

REMOVE

a. Remove retaining ring and thermal disc from discharge port of indicator body on right side of helicopter.

INSTALL

b. Install new thermal disc and retaining ring in discharge port of indicator body.

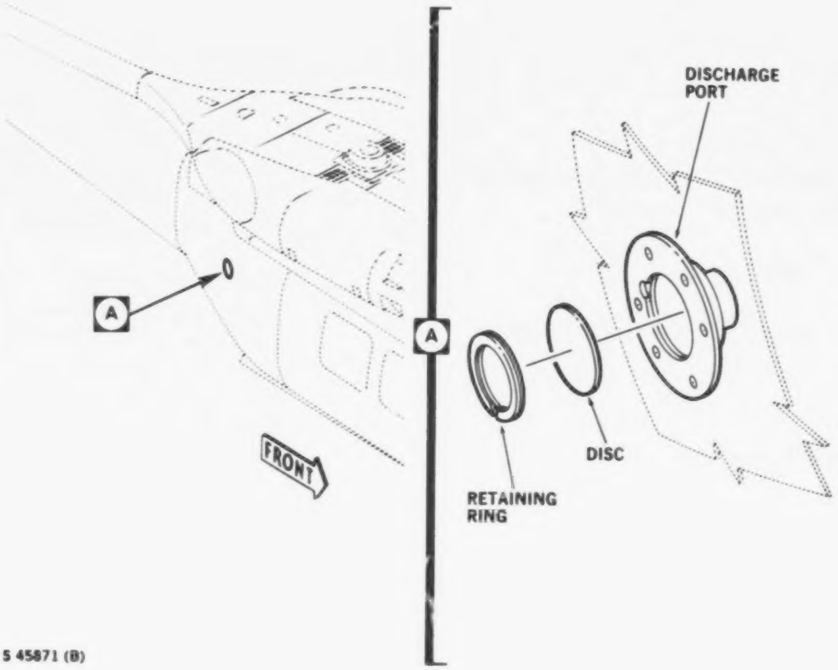

DISCHARGE PORT
A
FRONT
A
DISC
RETAINING RING
5 45871 (B)

FIGURE 12-4

12-1.6 REPLACE DISCHARGE TUBES 12-1.6

REMOVE

a. Turn off all electrical power.

b. Open engine, oil cooler, and APU compartment doors as required.

c. Disconnect tubes. Remove clamps.

d. Remove tubes. Cap tubes and ports.

INSPECT

e. Check for dents or distortion in tubes. Replace tube if dents are:

(1) **DEEPER THAN 0.080-INCH.**

(2) **WITHIN 4-INCHES OF EACH OTHER.**

INSTALL

f. Turn off all electrical power.

NOTE

- Make sure tube to be installed is clear of any obstructions.
- **TIGHTEN ALL B-NUTS 1/6 - 1/3 TURN BEYOND POINT WHERE SHARP RISE IN TORQUE IS FELT.**

g. Remove caps and install and connect tubes.

h. Install clamps.

i. Make sure discharge tubes are positioned as follows:

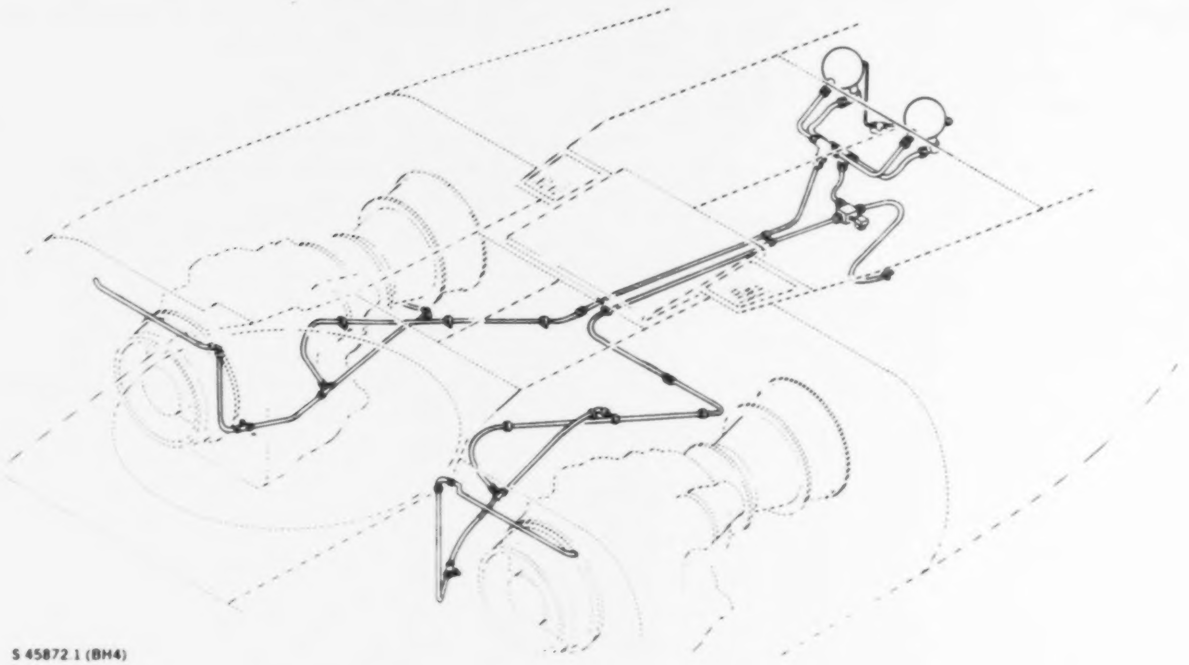
(1) The target point at which the left-hand discharge tube should aim is 1-1/2 inches up from the engine-mounted fuel filter base and 3/8 inch inboard of fuel filter centerline. The target zone is a 2-inch diameter circle around the target point.

(2) The target point at which the right-hand discharge tube should aim is 5-1/2 inches aft of the air inlet firewall, measured along the engine inlet duct bleed air line, and 3/8 inch inboard of the bleed air line centerline. The target zone is a 2-inch diameter circle around the target point.

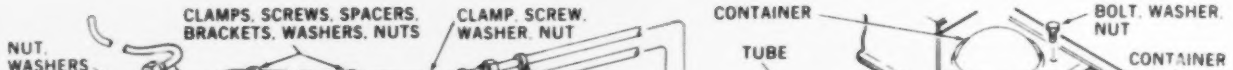
j. Make sure compartment area is free of foreign objects.

k. Close and latch engine, oil cooler, and APU compartment doors.

12-1.6 REPLACE DISCHARGE TUBES 12-1.6



S 45872.1 (BH4)


NUT, WASHERS
CLAMPS, SCREWS, SPACERS, BRACKETS, WASHERS, NUTS
CLAMP, SCREW, WASHER, NUT
CONTAINER
BOLT, WASHER, NUT
TUBE
CONTAINER
TUBES
NUT, WASHERS
CLAMP, SCREW, WASHER
ELBOW
ELBOW
NUT, WASHERS
CLAMP, SCREW, WASHER, NUT BRACKET
TWO-WAY CHECK VALVE
TUBE
TEE
REDUCER
TUBE
REDUCER
TUBE
THERMAL RELIEF LINE
SPACER
CLAMP, SPACER, BRACKET, SCREW, WASHER, NUT
PACKING
TEE
ELBOW
NUT
TUBE
TUBES
TEE
NUT
TUBE
REDUCER
CLAMP, SCREW, WASHER, NUT
NUT
TWO-WAY CHECK VALVE
WASHER
REDUCER
TUBE
PACKING
NUT, WASHER
WASHER
ELBOW
TEE
CLAMP, SCREW, WASHER
UNION
NUT
TUBE
NUT, WASHERS
TUBES
BOLT
TUBE
NUT
TUBES
REDUCER
CLAMP
REDUCER
SPACER
TUBE
DIRECTIONAL VALVE
NUT, WASHERS
SPACER

UH60A 45872.2 (BH6)

FIGURE 12-5

12-1.7 REPLACE DIRECTIONAL VALVE 12-1.7

REMOVE

a. Open APU compartment door on right side of helicopter.

b. Turn off all electrical power.

c. Tag and disconnect wires from terminal block on directional valve.

d. Disconnect tubes from directional valve. Plug tubes.

e. Remove bolts, directional valve, and spacers from APU compartment deck.

f. Remove nut and reducer from directional valve.

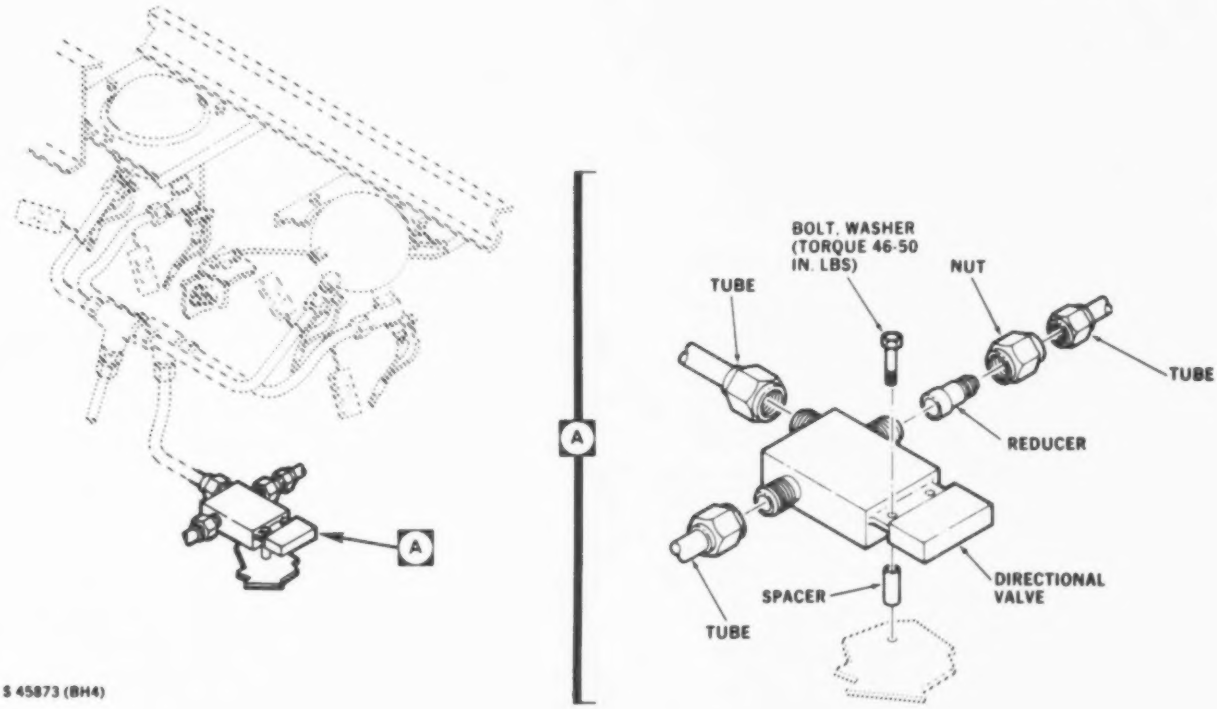
NOTE

TIGHTEN ALL B-NUTS 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.

INSTALL

g. Turn off all electrical power.

h. Install reducer and nut on directional valve.


A
A
BOLT, WASHER (TORQUE 46-50 IN. LBS)
TUBE
NUT
TUBE
REDUCER
A
DIRECTIONAL VALVE
SPACER
TUBE
TUBE

S 45873 (BH4)

FIGURE 12-6

12-1.7 REPLACE DIRECTIONAL VALVE 12-1.7

CAUTION

Mount valve so that normally open port (small diameter) faces No. 1 engine tube, and normally closed port faces APU tube (reducer faces rear).

i. Install directional valve on APU compartment deck with spacers and bolts. **TORQUE BOLTS TO 46 - 50 INCH-POUNDS.**

j. Unplug and connect tubes to directional valve.

k. Remove tags and connect wires to terminal block on directional valve.

l. Do an operational check of directional valve (TM 55-1520-237-T).

m. Check area to be sure it is free of foreign objects, then close and latch APU compartment door.

12-2 FIRE DETECTION/EXTINGUISHING SYSTEM 12-2

PARAGRAPH BREAKDOWN

12-2.1	REPLACE CONTROL AMPLIFIER
12-2.2	REPLACE FIRE DETECTORS
12-2.3	REPLACE FIRE DETECTOR SWITCH
12-2.4	REPLACE APU T-HANDLE FIRE DETECTION LAMPS
12-2.5	REPLACE ENGINE QUADRANT T-HANDLE FIRE DETECTION LAMPS
12-2.6	REPLACE APU T-HANDLE
12-2.7	REPLACE APU T-HANDLE FIRE EXTINGUISHER SWITCH ASSEMBLY

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68F - Aircraft Electrical Repairer
- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Cloth, Cleaning, Item 111, Appendix D
- Degreasing Solvent, Item 131, Appendix D
- Dry-Cleaning Solvent, Item 135, Appendix D
- Sealing Compound, Item 312, Appendix D
- Solder, Item 328, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Soldering Gun, W-6-564
- Tags

REFERENCES

- PARA 2-32
- TM 55-1520-237-T

12-2.1 REPLACE CONTROL AMPLIFIER 12-2.1

NOTE

The following procedure applies to the three installed control amplifiers.

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels from cabin ceiling at station 265 to get to amplifiers.

c. Disconnect electrical connector from control amplifier.

d. Remove screws, washers, and control amplifier from bracket.

INSTALL

e. Turn off all electrical power.

f. Clean surface around all mounting holes with dry-cleaning solvent, Item 135, Appendix D, for good electrical ground contacts.

g. Fasten control amplifier to bracket with screws and washers.

h. Connect electrical connector to control amplifier.

i. Make sure area is free of foreign objects before installing soundproofing.

j. Install soundproofing panels on cabin ceiling.

k. Do an operational check of fire detection system (TM 55-1520-237-T).

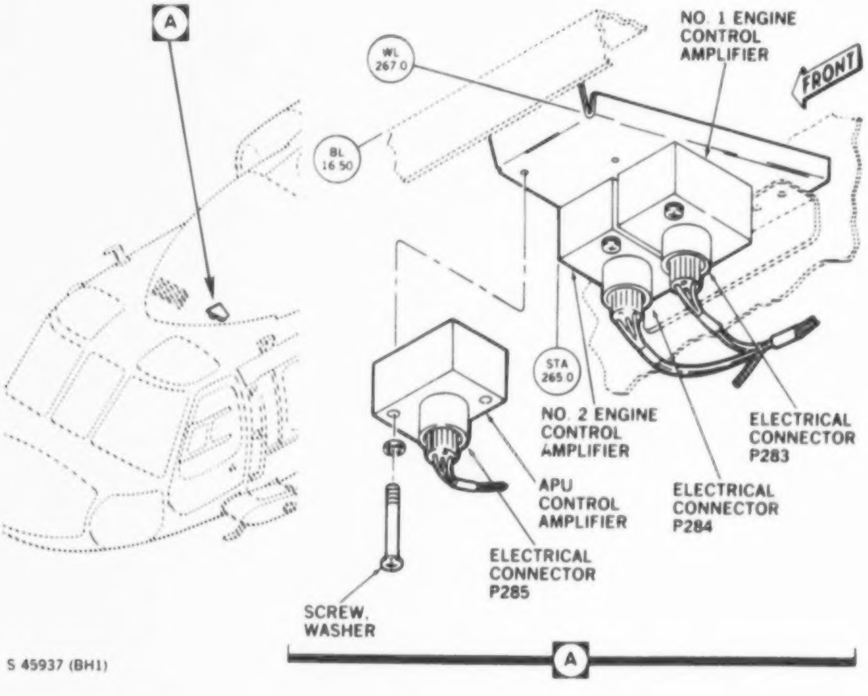

A
WL 267.0
BL 16.50
NO. 1 ENGINE CONTROL AMPLIFIER
FRONT
STA 265.0
NO. 2 ENGINE CONTROL AMPLIFIER
ELECTRICAL CONNECTOR P283
APU CONTROL AMPLIFIER
ELECTRICAL CONNECTOR P284
ELECTRICAL CONNECTOR P285
SCREW, WASHER
S 45937 (BH1)
A

FIGURE 12-7

12-2.2 REPLACE FIRE DETECTORS 12-2.2

NOTE

This step applies for the three firewall and two deck-mounted fire detectors. The deck-mounted fire detectors contain a shield.

REMOVE

a. Turn off all electrical power.

b. Open access panels and remove soundproofing panels from cabin ceiling at station 371 to disconnect deck-mounted fire detector connectors (PARA 2-32).

c. Disconnect electrical connector.

d. Remove screws (and shield if unit is deck-mounted) and remove detector.

e. If replacing a deck-mounted detector, remove sealing compound from airframe structure.

f. Clean sealing compound with a clean cloth dampened with degreasing solvent, Item 131, Appendix D.

INSTALL

NOTE

For good electrical ground contact, before mounting fire detector, make certain that mounting holes are clean and free of paint.

g. Turn off all electrical power.

h. Connect electrical connector to fire detector.

i. Install fire detector (and shield if unit is deck-mounted) with screws and washers.

j. If detector is deck-mounted, apply sealing compound, Item 312, Appendix D, around junction of airframe and detector shield.

k. If necessary, clean off extra sealing compound with a cloth wet with degreasing solvent, Item 131, Appendix D, while compound is still soft.

l. Make sure area is free of foreign objects before installing soundproofing.

m. Install soundproofing panels on cabin ceiling and close access panels (PARA 2-32).

n. Do an operational check of fire detection system (TM 55-1520-237-T).

12-2.2 REPLACE FIRE DETECTORS 12-2.2

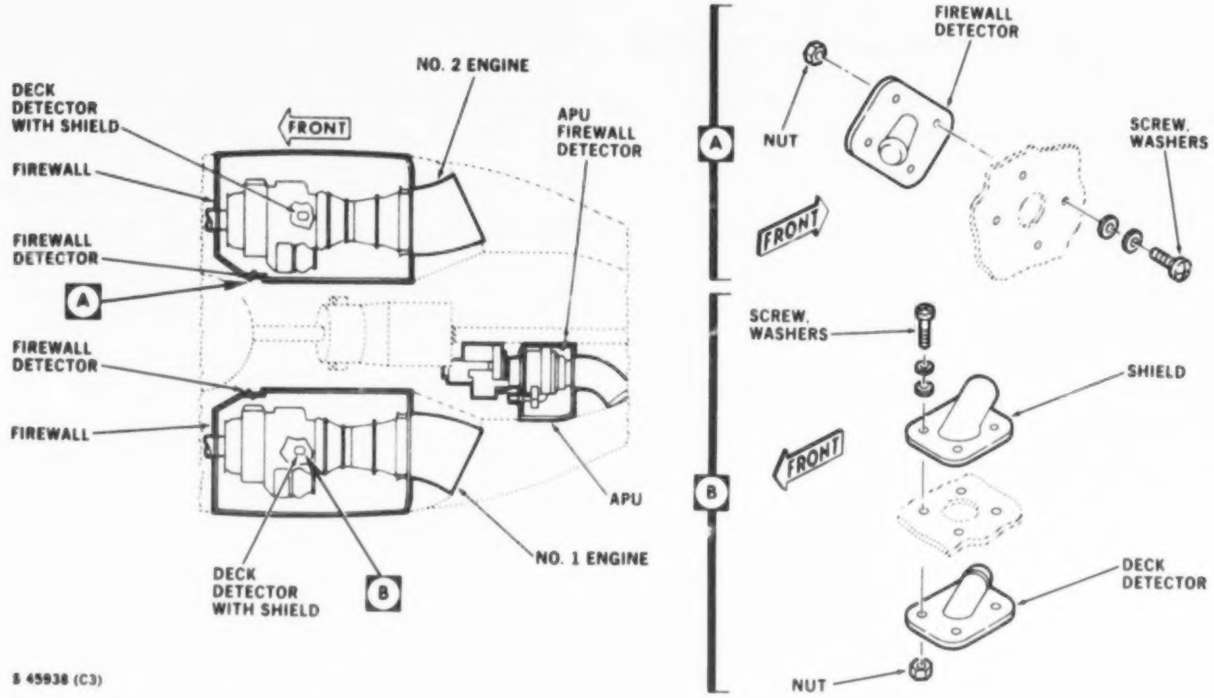

NO. 2 ENGINE
DECK DETECTOR WITH SHIELD
FRONT
APU FIREWALL DETECTOR
FIREWALL
FIREWALL DETECTOR
A
FIREWALL DETECTOR
FIREWALL
APU
NO. 1 ENGINE
DECK DETECTOR WITH SHIELD
B
S 45938 (C3)
FIREWALL DETECTOR
A
NUT
SCREW, WASHERS
FRONT
SCREW, WASHERS
SHIELD
FRONT
B
DECK DETECTOR
NUT

FIGURE 12-8

12.2.3 REPLACE FIRE DETECTOR SWITCH 12.2.3

REMOVE

a. Turn off all electrical power and disconnect battery.

b. Unfasten and slowly hinge down upper console.

c. Tag and unsolder wires from switch.

d. Loosen setscrews and remove fire detector switch knob.

e. Remove APU fire extinguisher T-handle.

f. Unscrew and remove cargo hook emergency test light lens cap.

g. Remove screws and information plate.

h. Remove nut securing switch to upper console and remove switch.

INSTALL

i. Turn off all electrical power and disconnect battery.

j. Turn switch shaft fully counterclockwise.

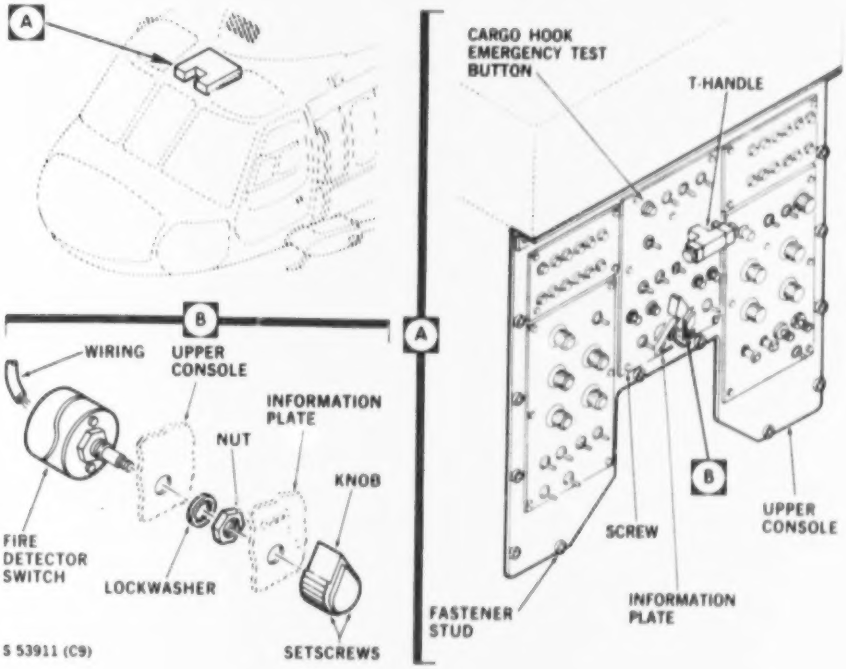

A
B
WIRING
UPPER CONSOLE
INFORMATION PLATE
NUT
KNOB
FIRE DETECTOR SWITCH
LOCKWASHER
SETSCREWS
S 53911 (C9)
A
CARGO HOOK EMERGENCY TEST BUTTON
T-HANDLE
B
SCREW
UPPER CONSOLE
FASTENER STUD
INFORMATION PLATE

FIGURE 12-9

12.2.3 REPLACE FIRE DETECTOR SWITCH 12.2.3

k. Insert switch control shaft through back of upper console, and secure with nut and lockwasher.

l. Install information plate on console and fasten with screws.

m. Install APU fire extinguisher T-handle.

n. Install and tighten cargo hook emergency test light lens cap.

o. Place knob on shaft, lining up knob index mark with OPER markings on information plate, and tighten setscrews.

p. Solder, Item 328, Appendix D, wires to switch and remove tags.

q. Make sure area is free of foreign objects before closing upper console.

r. Carefully hinge up and fasten upper console.

s. Connect battery.

t. Do an operational check of fire detection system (TM 55-1520-237-T).

12-2.4 REPLACE APU T-HANDLE FIRE DETECTION LAMPS 12-2.4

REMOVE

a. Turn off all electrical power.

b. Unscrew and remove red filter and preformed packing.

c. Remove lamp from filter.

INSTALL

d. Turn off all electrical power.

e. Insert lamp into filter.

f. Install preformed packing and screw filter into T-handle.

g. Do an operational check of fire detection system (TM 55-1520-237-T).

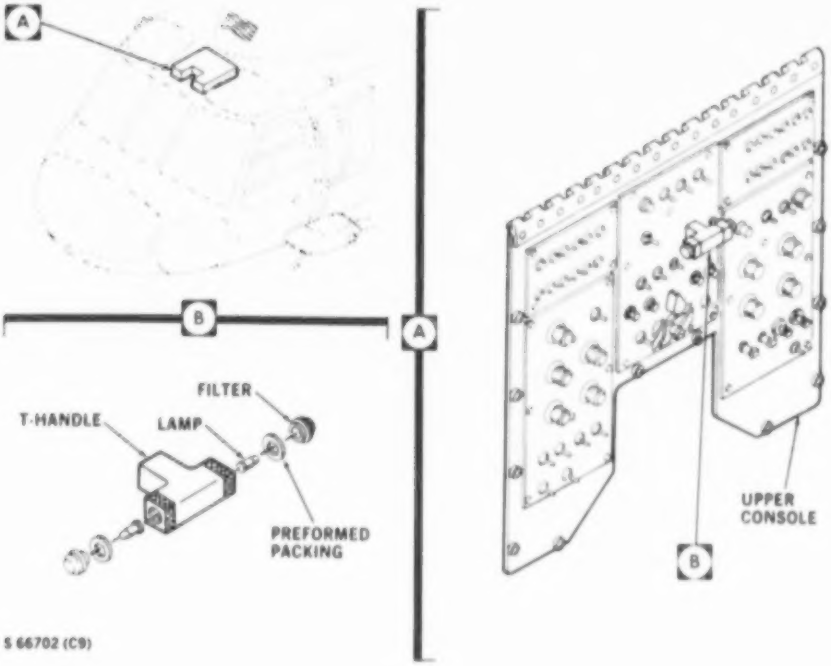

A
B
FILTER
T-HANDLE
LAMP
PREFORMED PACKING
A
UPPER CONSOLE
B
S 66702 (C9)

FIGURE 12-10

12-2.5 REPLACE ENGINE QUADRANT T-HANDLE FIRE DETECTION LAMPS 12-2.5

NOTE

There are two engine quadrant T-handles. There are two lamps in each T-handle. Lamp replacement is the same for all.

REMOVE

a. Turn off all electrical power.

b. Carefully remove lens from T-handle.

c. Remove lamp from T-handle.

INSTALL

d. Turn off all electrical power.

e. Place lamp in T-handle with flanged base on inboard side lamp holder.

f. Snap lens in place on T-handle.

g. Do an operational check of fire detection system (TM 55-1520-237-T)

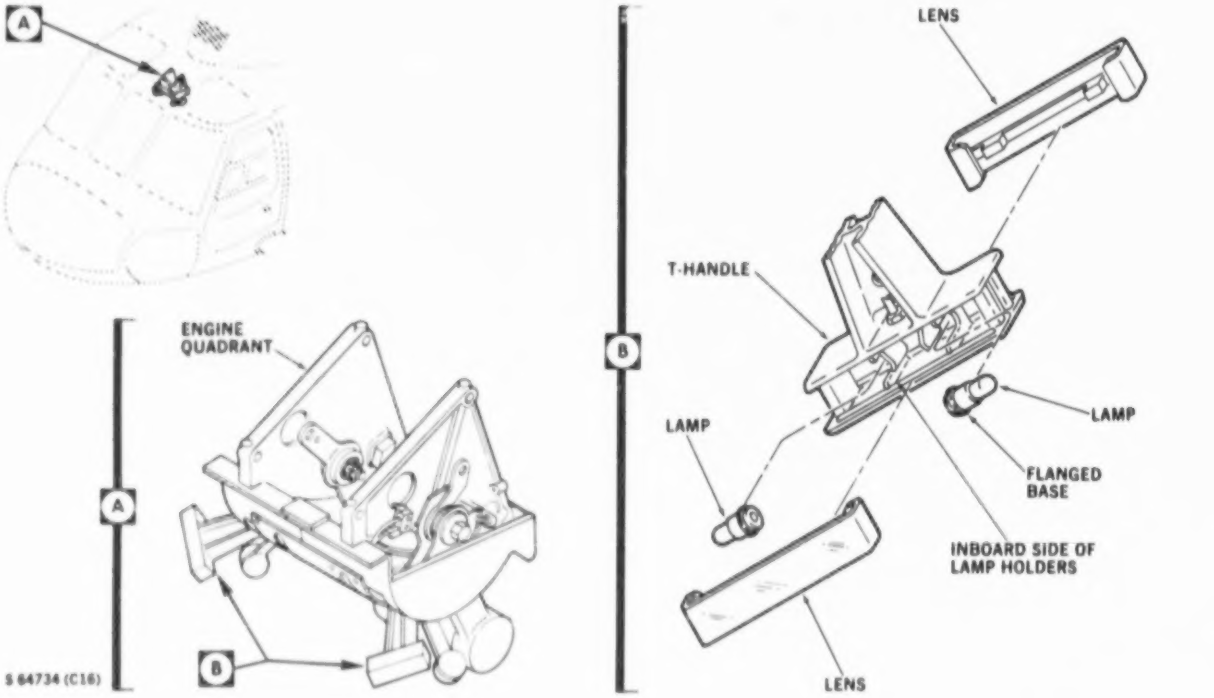

A
ENGINE QUADRANT
A
B
S 64734 (C16)
B
LENS
T-HANDLE
LAMP
LAMP
FLANGED BASE
INBOARD SIDE OF LAMP HOLDERS
LENS

FIGURE 12-11

12-2.6 REPLACE APU T-HANDLE 12-2.6

REMOVE

a. Turn off all electrical power.

b. Remove screw from T-handle.

c. Pull T-handle outward off shaft.

INSTALL

a. Turn off all electrical power.

e. Place T-handle on shaft and push it on.

f. Line up holes and install screw.

g. Do an operational check (TM 55-1520-237-T) to make sure original trouble that resulted in replacing the T-handle has been corrected.

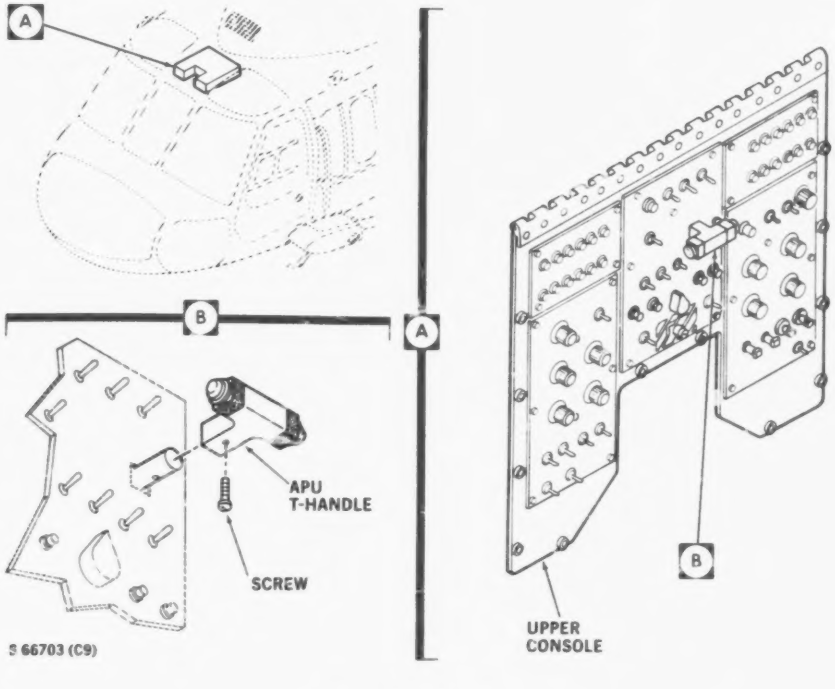

A
B
A
APU T-HANDLE
SCREW
B
UPPER CONSOLE
S 66703 (C9)

FIGURE 12-12

12-2.7 REPLACE APU T-HANDLE FIRE EXTINGUISHER SWITCH ASSEMBLY 12-2.7

REMOVE

a. Turn off all electrical power and place BAT switch OFF.

b. Unfasten and remove battery cover from battery support.

c. Disconnect battery connector, P140, from battery.

d. Loosen setscrews on FIRE DET TEST switch and remove knob.

e. Unscrew CARGO HOOK EMER TEST lens cap and remove it.

f. Remove screw from APU T-handle and remove T-handle.

g. Remove screws holding information plate and remove plate.

h. Loosen fastener studs holding upper console and swing down console.

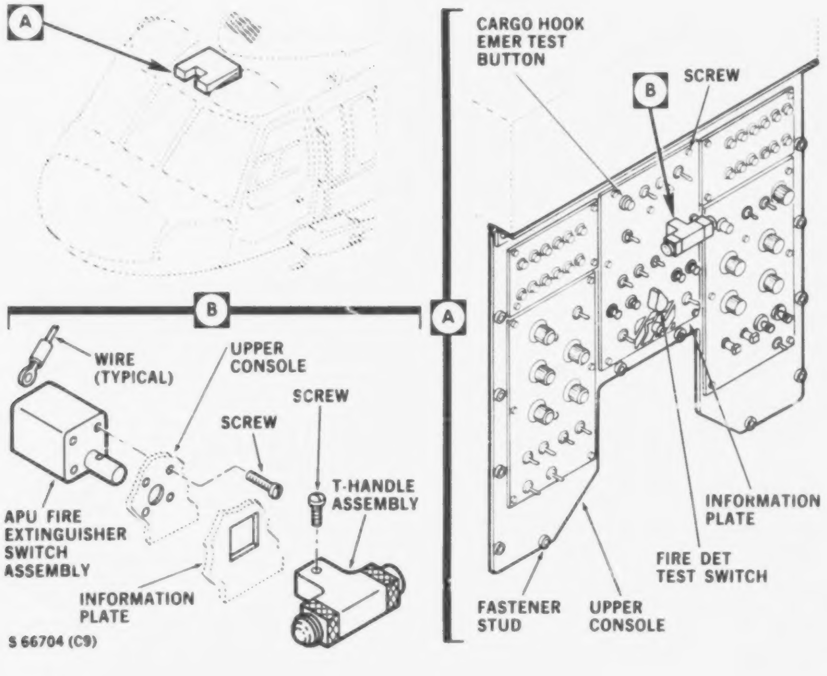

A
CARGO HOOK EMER TEST BUTTON
B
SCREW
B
A
WIRE (TYPICAL)
UPPER CONSOLE
SCREW
SCREW
T-HANDLE ASSEMBLY
APU FIRE EXTINGUISHER SWITCH ASSEMBLY
INFORMATION PLATE
S 66704 (C9)
INFORMATION PLATE
FIRE DET TEST SWITCH
FASTENER STUD
UPPER CONSOLE

FIGURE 12-13

12-2.7 REPLACE APU T-HANDLE FIRE EXTINGUISHER SWITCH ASSEMBLY 12-2.7

i. Tag and remove wires from T-handle switches.

j. Remove screws holding APU T-handle fire extinguisher switch assembly and remove assembly.

INSTALL

k. Turn off all electrical power.

l. Insert switch assembly control shaft through back of upper console and secure with screws.

m. Attach wires to switches with screws and washers, and remove tags.

n. Make sure area is free of foreign objects before closing upper console.

o. Carefully hinge up and fasten upper console.

p. Install information plate on console with screws.

q. Place T-handle on shaft, lineup holes and install screw.

r. Screw on CARGO HOOK EMER TEST lens cap.

s. Install FIRE DET TEST switch knob and tighten setscrews.

t. Connect battery connector, P140, to battery.

u. Make sure area is free of foreign objects before fastening battery cover.

v. Fasten battery cover to battery support.

w. Do an operational check of engine fire extinguishing system (TM 55-1520-237-T).

12-3 WINDSHIELD WIPER 12-3

PARAGRAPH BREAKDOWN

12-3.1 REPLACE CONVERTER
12-3.2 REPLACE WIPER MOTOR
12-3.3 REPLACE FLEXIBLE DRIVE SHAFT
12-3.4 REPLACE WIPER BLADE
12-3.5 REPLACE WIPER BLADE INSERT
12-3.6 REPLACE WIPER ARM AND LINK
12-3.7 ADJUST WIPER ARM PRESSURE

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Alodine, Item 74, Appendix D
- Cotter Pin, MS24665-153
- Cotter Pin, MS24665-372
- Dry-Cleaning Solvent, Item 135, Appendix D
- Grease, Item 168, Appendix D
- Lacquer, Item 191, Appendix D
- Lockwire, Item 199, Appendix D
- Machinery Towel, Item 227, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Primer, Item 274, Appendix D
- Scouring Pad, Item 299, Appendix D
- Preformed Packing, MS28775-012
- Sealing Compound, Item 312, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Nonmetallic Scraper, Locally-Made
- Scale, Spring, 0 - 10 lbs, AAA-S-133
- Torque Wrench, 30 - 150 in. lbs., GGG-W-00686
- Wrench, XW20509

REFERENCES

- PARA 2-5
- TM 11-1520-237-23-3
- TM 43-0105
- TM 55-1500-335-23
- TM 55-1520-237-T

12-3.1 REPLACE CONVERTER 12-3.1

REMOVE

a. Turn off all electrical power.

b. Remove pilot's or copilot's kick panel from under instrument panel as required.

c. With wiper blades in park position, hold wiper arm away from windshield. Insert cotter pin, MS24665-372, in hole in arm, to lock blade away from windshield surface.

d. Unpin link from pivot stud.

e. Remove bolt and washer from end of converter shaft.

f. Loosen wiper arm Allen-head screw. Remove wiper arm, wiper blade, and link assembly from converter shaft and pivot stud.

NOTE

If wiper arm is frozen on converter shaft, slightly spread bottom of arm using a common screwdriver.

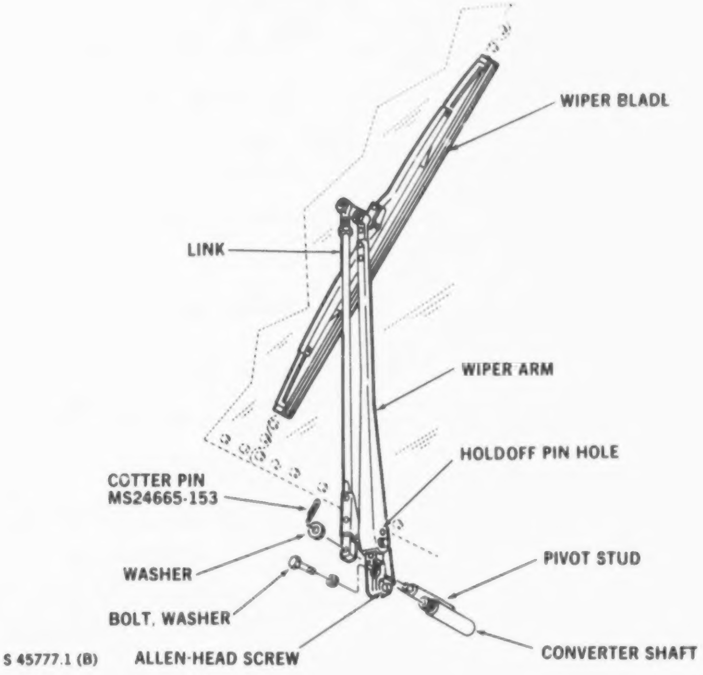

WIPER BLADE
LINK
WIPER ARM
HOLDOFF PIN HOLE
COTTER PIN
MS24665-153
WASHER
PIVOT STUD
BOLT, WASHER
S 45777.1 (B)
ALLEN-HEAD SCREW
CONVERTER SHAFT

FIGURE 12-14 (SHEET 1 OF 4)

12-3.1 REPLACE CONVERTER 12-3.1

CAUTION

When disconnecting flexible drive shaft from converter, make sure coupling does not fall from either drive shaft or converter into electronic equipment.

g. Disconnect flexible drive shaft from converter behind cockpit instrument panel. Keep coupling with flexible drive shaft.

h. From inside of cockpit, remove cotter pin from upper inboard pivot stud. Remove nuts and washers.

i. With aid of assistant on outside of helicopter nose canopy, remove pivot stud from converter and remove from helicopter.

j. Remove screws, washers, and nuts, securing converter to helicopter nose canopy. Remove jumper wire.

k. Remove converter from helicopter.

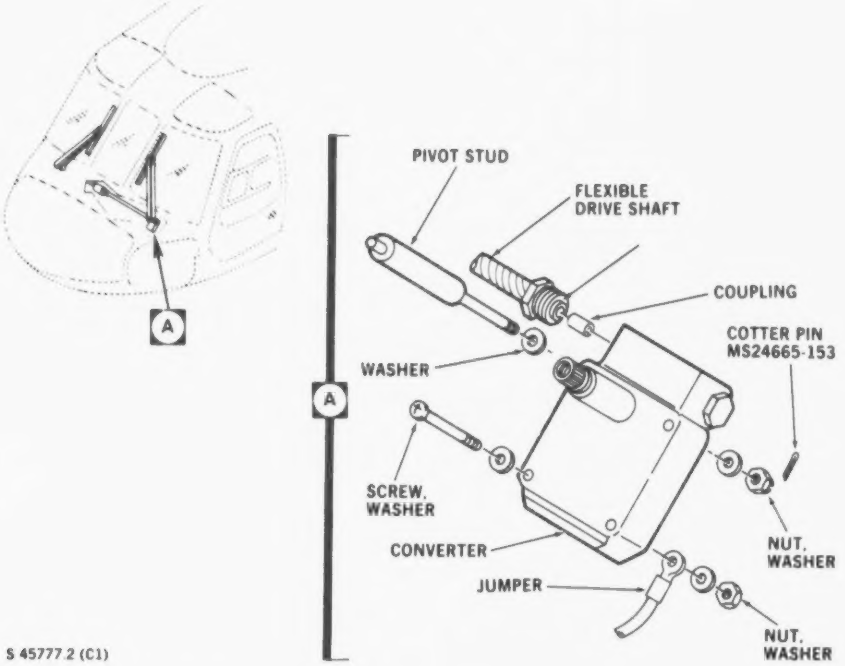

A
PIVOT STUD
FLEXIBLE DRIVE SHAFT
COUPLING
COTTER PIN MS24665-153
WASHER
A
SCREW, WASHER
CONVERTER
NUT, WASHER
JUMPER
NUT, WASHER
S 45777.2 (C1)

FIGURE 12-14 (SHEET 2 OF 4)

12-3.1 REPLACE CONVERTER 12-3.1

DISASSEMBLE

l. Remove bolt, retaining ring, nylon sleeve, sleeve and packing from wiper shaft.

NOTE

Sealing compound is used to seal front cover to body. A nonmetallic scraper may be needed to loosen cover.

m. Remove screws, washers, nut, and front cover from housing.

n. Remove end cap from housing.

o. Remove sleeve and packing from front cover.

p. Remove converter linkage, as an assembly, from housing.

INSPECT

q. Visually inspect pivot stud for corrosion (TM 55-1500-335-23). Corrosion is indicated by red film or pitting.

r. **PITS ON WEARING SURFACE SHALL NOT EXCEED 0.050 INCH IN DIAMETER.**

s. Clean grease from converter linkage, housing and front cover using a clean cloth dampened with dry-cleaning solvent, Item 135, Appendix D, and wipe dry. Avoid getting solvent into bearings.

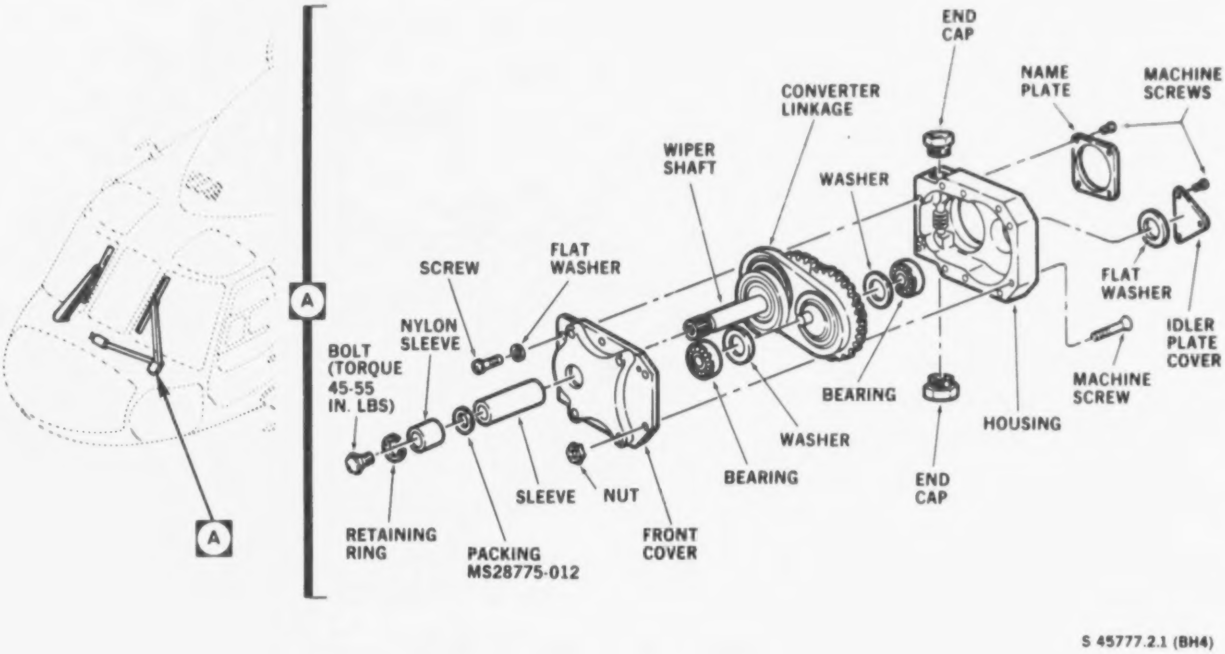

A
A
END CAP
NAME PLATE
MACHINE SCREWS
CONVERTER LINKAGE
WIPER SHAFT
WASHER
FLAT WASHER
SCREW
FLAT WASHER
NYLON SLEEVE
BOLT (TORQUE 45-55 IN. LBS)
IDLER PLATE COVER
MACHINE SCREW
BEARING
HOUSING
WASHER
BEARING
END CAP
SLEEVE
NUT
RETAINING RING
PACKING MS28775-012
FRONT COVER
S 45777.2.1 (BH4)

FIGURE 12-14 (SHEET 3 OF 4)

12-3.1 REPLACE CONVERTER 12-3.1

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

t. Clean remaining sealing compound from front cover and housing mating surfaces using a nonmetallic scraper. Wipe area clean using a machinery towel, Item 277, Appendix D, dampened with methyl ethyl ketone, Item 233, Appendix D.

REPAIR

u. Remove corrosion on pivot stud manually, using scouring pad, Item 299, Appendix D.

v. Mix solution of 1 part corrosion removal and treatment compound, Item 126, Appendix D, to 1 part water.

w. Apply compound solution to corroded areas of pivot stud.

x. Rinse thoroughly with clean water.

y. Touch up paint with primer, Item 274, Appendix D, and lusterless black lacquer, Item 191, Appendix D.

LUBRICATE

z. Pack housing with grease, Item 168, Appendix D.

aa. Pack gears and bearings on end of converter linkage with grease, Item 168, Appendix D.

ASSEMBLE

ab. Install end cap on housing.

ac. Install converter linkage as an assembly, in housing.

ad. Install sleeve and packing, MS28775-012, in sleeve on housing.

ae. Apply a thin even coat of sealing compound, Item 312, Appendix D, to mating surfaces of front cover and housing. Allow sealing compound to become tacky.

af. Install front cover on housing using screws, washers, and nuts. Lockwire, Item 199, Appendix D, screws to each other.

ag. Install nylon sleeve, retaining ring, and bolt on wiper shaft.

INSTALL

ah. Turn off all electrical power.

ai. Clean mating surface of converter where jumper wire is installed as follows:

  (1) Wipe area clean using clean cloth damp with dry-cleaning solvent, Item 135, Appendix D.

  (2) Remove paint from mounting area (just slightly larger than jumper wire lug).

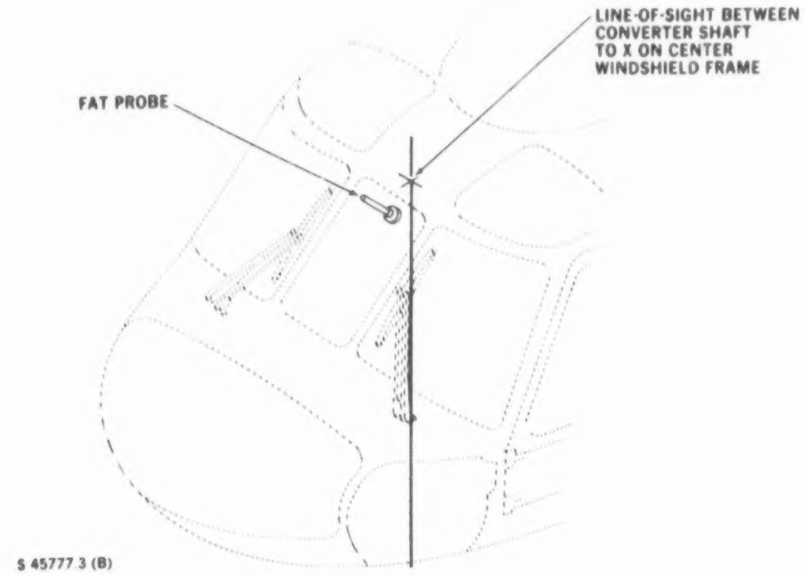


FIGURE 12-14 (SHEET 4 OF 4)

(3) Clean area of abrasives or filings.

(4) Treat cleaned area using alodine, Item 74, Appendix D.

aj. Seal all gaps between wiper shaft, pivot stud, attaching screws, and mounting points in helicopter skin with sealing compound, Item 312, Appendix D.

ak. Fasten converter to helicopter nose canopy with screws, washers, and nuts.

al. Position jumper wire on converter and install screw, washers, and nut.

am. Seal area around jumper wire with sealing compound, Item 312, Appendix D.

an. From outside helicopter, install pivot stud in converter and fasten with washers, nut, and cotter pin, MS24665-153.

ao. Seal opening where pivot stud passes through skin with sealing compound, Item 312, Appendix D.

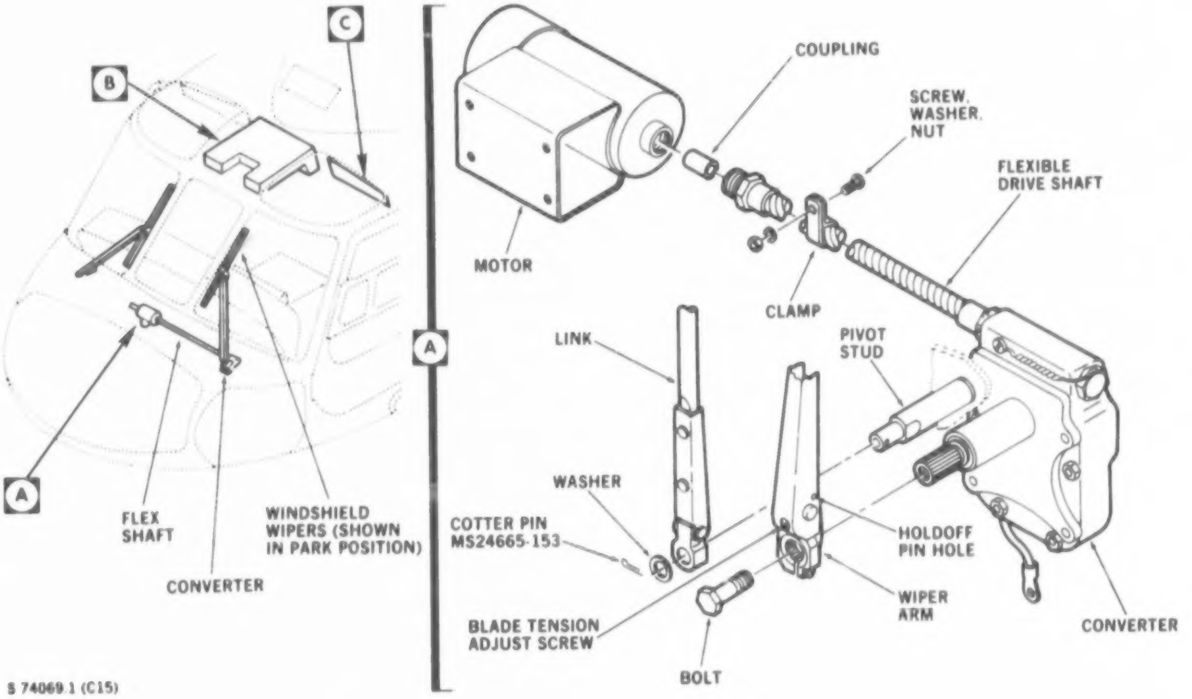
CAUTION

Make sure coupling is installed in flexible drive shaft casing before connecting drive shaft to converter.

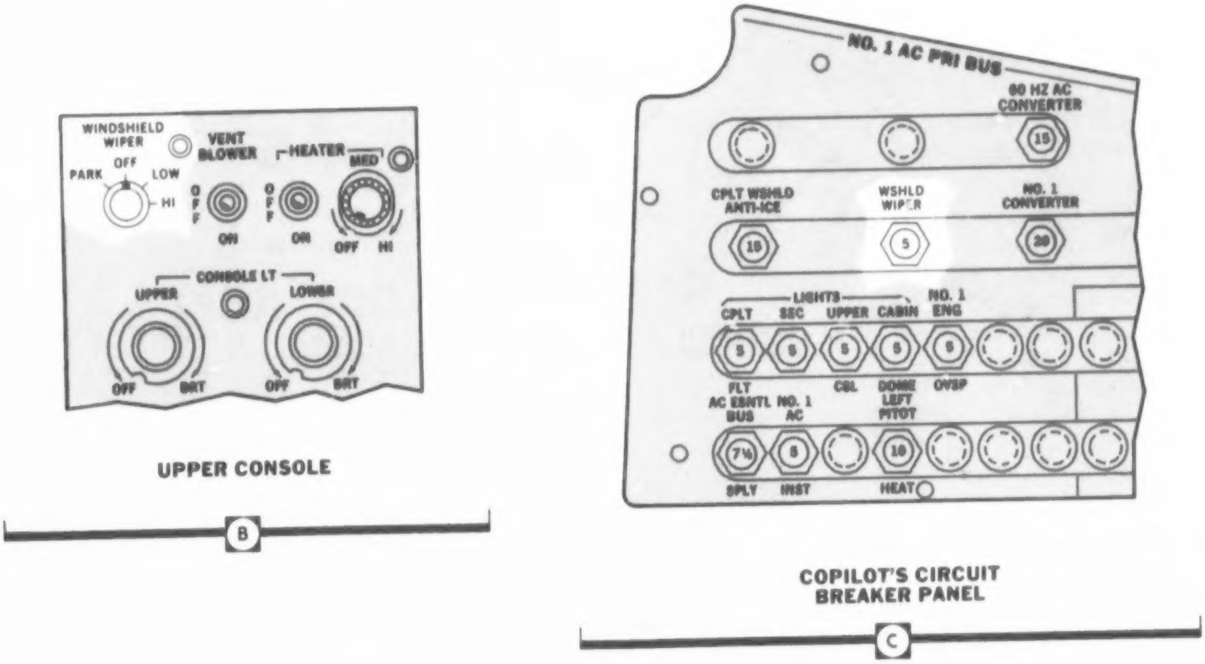
ap. Install coupling in flexible drive shaft casing. Connect flexible drive shaft to converter and lockwire, Item 199, Appendix D, coupling nut.

aq. Hold blade off windshield by inserting cotter pin, MS24665-372, in wiper arm pin hole.

12-3.1 REPLACE CONVERTER 12-3.1


C
B
A
FLEX SHAFT
CONVERTER
WINDSHIELD WIPERS (SHOWN IN PARK POSITION)
A
MOTOR
COUPLING
SCREW, WASHER, NUT
FLEXIBLE DRIVE SHAFT
CLAMP
LINK
PIVOT STUD
WASHER
COTTER PIN MS24665-153
HOLDOFF PIN HOLE
WIPER ARM
BLADE TENSION ADJUST SCREW
BOLT
CONVERTER

S 74069.1 (C15)


WINDSHIELD WIPER
PARK
OFF
LOW
HI
VENT BLOWER
OFF
ON
HEATER
OFF
ON
MED
OFF
HI
CONSOLE LT
UPPER
LOWER
OFF
BRT
OFF
BRT
B
NO. 1 AC PRI BUS
60 HZ AC CONVERTER
15
CPLT WSHLD ANTI-ICE
15
WSHLD WIPER
5
NO. 1 CONVERTER
20
LIGHTS
CPLT
SEC
UPPER
CABIN
NO. 1 ENG
5
5
5
5
5
FLT
CSL
DOME
OVSP
AC ESNTL BUS
NO. 1 AC
LEFT PITOT
7½
5
10
SPLY
INST
HEAT
C

UPPER CONSOLE

COPILOT'S CIRCUIT BREAKER PANEL

S 74069.2 (C15)

FIGURE 12-15

12-3.1 REPLACE CONVERTER 12-3.1

ar. Operate APU or connect external electrical power to helicopter.

as. Rotate WINDSHIELD WIPER switch on upper console to LOW, then OFF and then to PARK.

at. Place wiper arm on converter shaft, and link on pivot stud with wiper arm in parked position, inboard about 40° from centerline of converter. Alternate method of lining up wiper arm in proper position is a direct line-of-sight from converter shaft to 1 inch above FAT probe on center windshield frame.

au. If additional adjustment is required to bring wiper into exact PARK alignment, do this:

(1) Shut off all electrical power to helicopter.

(2) Insert cotter pin, MS24665-372, in wiper arm pin hole.

(3) Disconnect flexible drive shaft at motor.

(4) Rotate flexible drive shaft coupling by hand until wiper blade moves into precise PARK position.

(5) Connect flexible drive shaft to motor and lockwire coupling nut.

av. Install bolt and washer on converter shaft. **TORQUE BOLT TO 45 - 55 INCH-POUNDS.**

aw. Tighten wiper arm Allen-head screw. Install washer and cotter pin, MS24665-153, on pivot stud. Lockwire, Item 199, Appendix D, bolt and Allen-head screw to wiper arm.

ax. Remove cotter pin, MS24665-372, from hole in wiper arm and ease wiper blade back to windshield.

ay. Check wiper arm tension (PARA 12-3.7). Check link adjustment (PARA 12-3.6).

az. Do an operational check of windshield wiper system (TM 55-1520-237-T).

ba. Make sure area is free of foreign material before closing up.

bb. Reinstall pilot's or copilot's kick panel under instrument panel.

12-3.2 REPLACE WIPER MOTOR 12-3.2

REMOVE

a. Turn off all electrical power.

b. Open nose door.

c. Remove avionics gear as required to get at wiper motor (TM 11-1520-237-23-3).

d. Disconnect electrical connector from receptacle on wiper motor.

CAUTION

When disconnecting flexible drive shafts from motor, make sure couplings do not fall from drive shaft casings or motor into electronic compartment.

e. Disconnect flexible drive shafts from motor. Keep couplings with flexible drive shafts.

f. With aid of assistant holding motor, remove screws on outside of helicopter nose canopy, holding motor to canopy. Remove motor from helicopter.

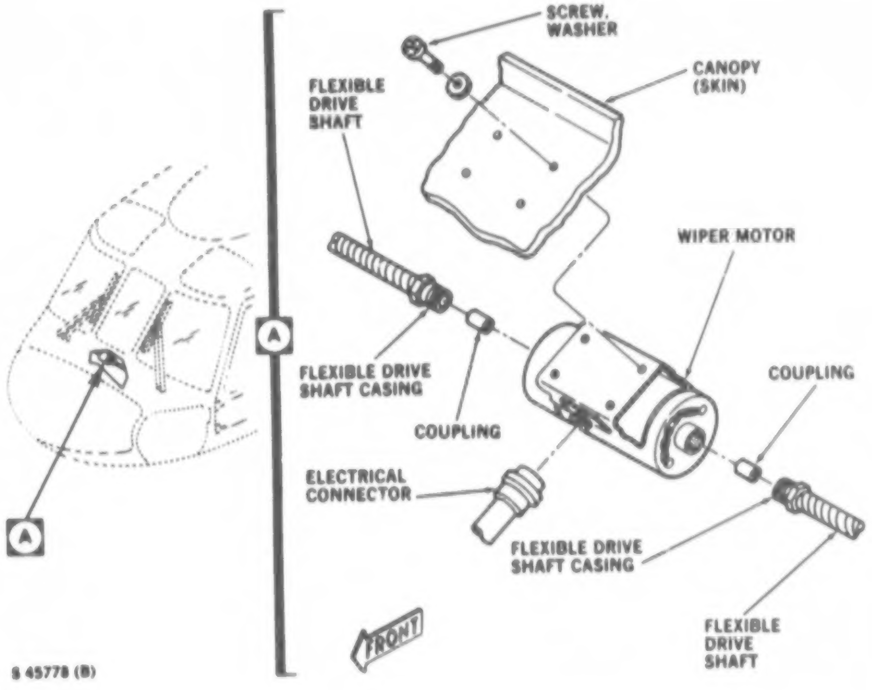

SCREW, WASHER
CANOPY (SKIN)
FLEXIBLE DRIVE SHAFT
WIPER MOTOR
A
FLEXIBLE DRIVE SHAFT CASING
COUPLING
COUPLING
ELECTRICAL CONNECTOR
A
FLEXIBLE DRIVE SHAFT CASING
FLEXIBLE DRIVE SHAFT
FRONT
S 45778 (B)

FIGURE 12-16

12-3.2 REPLACE WIPER MOTOR 12-3.2

INSTALL

g. Turn off all electrical power.

h. Seal area around attaching screw holes on wiper motor with sealing compound, Item 312, Appendix D.

i. With aid of assistant holding motor against inside of helicopter nose canopy, attach motor to canopy with washers and screws.

j. Seal area around screws with sealing compound, Item 312, Appendix D.

CAUTION

Make sure couplings are installed in flexible drive shaft casings before connecting drive shafts to motor.

k. Install couplings in flexible drive shaft casings. Connect flexible drive shafts to motor and lockwire, Item 199, Appendix D.

l. Connect electrical connector to receptacle on motor and lockwire, Item 199, Appendix D, connector.

m. Do an operational check of windshield wiper system (TM 55-1520-237-T).

n. Reinstall any previously removed avionics gear (TM 11-1520-237-23-3).

o. Check area for cleanness.

p. Close nose door.

12-3.3 REPLACE FLEXIBLE DRIVE SHAFT 12-3.3

REMOVE

a. Place wiper blades in park position.

b. Turn off all electrical power.

c. Open nose door.

d. Remove avionics gear as required to get at flexible drive shaft (TM 11-1520-237-23-3).

CAUTION

When disconnecting flexible drive shaft from converter and wiper motor, make sure couplings do not fall from drive shaft casings, converter, or motor into electronic compartment.

e. Disconnect flexible drive shaft from wiper motor, from inside nose compartment. Keep coupling with drive shaft.

f. Remove pilot's or copilot's kick panel from under instrument panel as required.

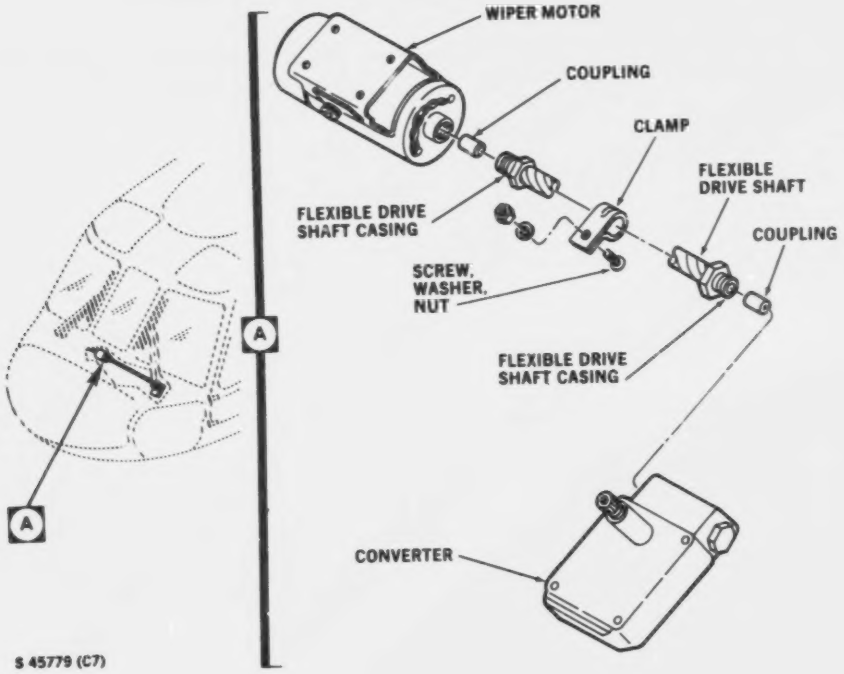

WIPER MOTOR
COUPLING
CLAMP
FLEXIBLE DRIVE SHAFT
COUPLING
FLEXIBLE DRIVE SHAFT CASING
SCREW, WASHER, NUT
FLEXIBLE DRIVE SHAFT CASING
CONVERTER
A
A
S 45779 (C7)

FIGURE 12-17

best copy available

12-3.3 REPLACE FLEXIBLE DRIVE SHAFT 12-3.3

g. Disconnect flexible drive shaft from converter behind cockpit instrument panel, from inside cockpit. Keep coupling with drive shaft.

h. Unclamp drive shaft from beam and remove shaft from helicopter. Remove clamp from shaft.

INSTALL

CAUTION

Make sure couplings are installed in flexible drive shaft casings before connecting drive shaft to wiper motor and converter.

i. Install couplings in flexible drive shaft casings. Connect flexible drive shaft to wiper motor and converter and lockwire, Item 199, Appendix D, coupling nut.

j. Install clamp on flexible drive shaft.

k. Fasten clamp to beam with screw, washer, and nut.

l. Do an operational check of windshield wiper system (TM 55-1520-237-T).

m. Reinstall any previously removed avionics gear (TM 11-1520-237-23-3).

n. Check area for cleanness and foreign material.

o. Close nose door.

p. Make sure area under instrument panel is free of foreign material.

q. Reinstall pilot's or copilot's kick panel under instrument panel.

12-3.4 REPLACE WIPER BLADE 12-3.4

REMOVE

a. With wiper blades in park position, hold wiper arm away from windshield. Insert cotter pin, MS24665-372, in hole in arm, to lock blade away from windshield surface.

b. Disconnect link from wiper blade.

c. Disconnect wiper arm from wiper blade and remove blade from helicopter.

INSTALL

d. Install wiper arm on wiper blade and fasten with washer and nut.

e. Install link on wiper blade and fasten with washer and nut.

f. Remove cotter pin, MS24665-372, from hole in wiper arm and ease wiper blade back to windshield.

g. Do an operational check (TM 55-1520-237-T).

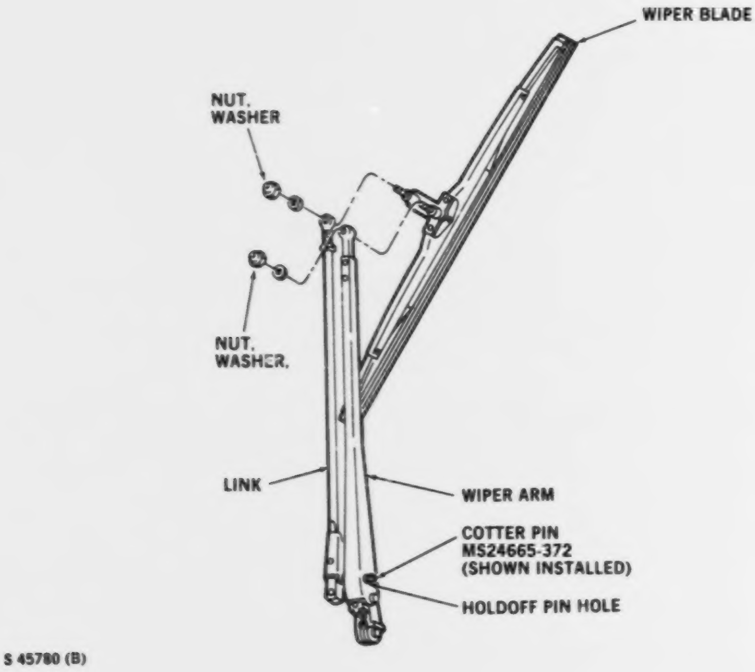

WIPER BLADE
NUT,
WASHER
NUT,
WASHER,
LINK
WIPER ARM
COTTER PIN
MS24665-372
(SHOWN INSTALLED)
HOLDOFF PIN HOLE
S 45780 (B)

FIGURE 12-18

12-3.5 REPLACE WIPER BLADE INSERT 12-3.5

REMOVE

a. Remove wiper blade (PARA 12-3.4).

b. Using thin bladed screwdriver, pry between end clip and metal reinforcement strip at each end of wiper blade. This unseats end clip from holes in metal reinforcement strip.

c. With end clip unseated, pull insert and metal reinforcement strips out of frame. Insert will have to be bowed slightly to remove it from frame.

d. Remove metal reinforcement strips from insert.

INSTALL

e. Install metal reinforcement strips in replacement insert.

f. Install insert and metal reinforcement strips into frame. Insert will have to be bowed slightly to install it in frame.

g. Slide end clip ends under lip of insert at ends of wiper blade.

h. Press end clips at ends of wiper blade towards each other at the same time, to seat end clips in holes in metal reinforcement strips.

i. Install wiper blade (PARA 12-3.4)

j. Do an operational check (TM 55-1520-237-T).

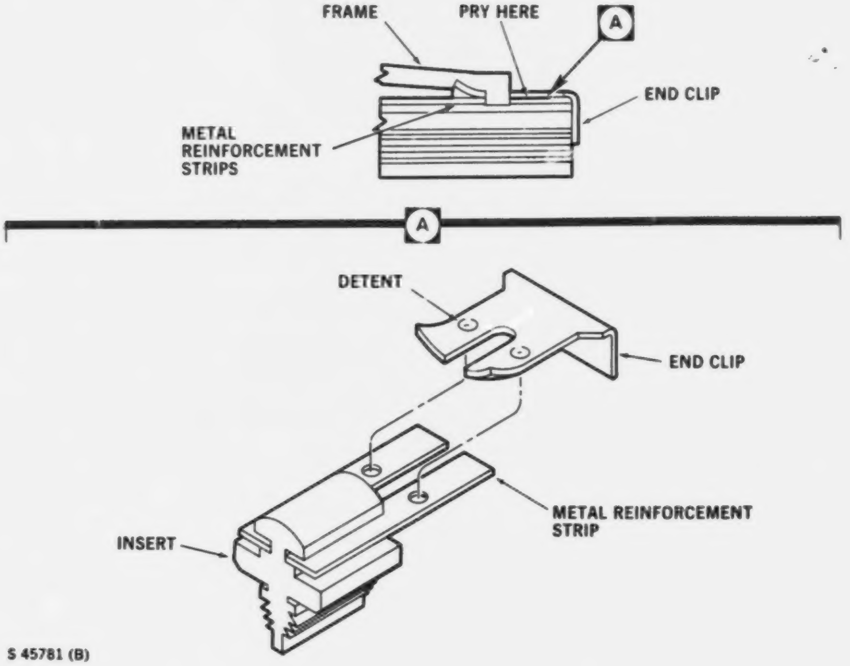

FRAME
PRY HERE
A
END CLIP
METAL REINFORCEMENT STRIPS
A
DETENT
END CLIP
METAL REINFORCEMENT STRIP
INSERT
S 45781 (B)

FIGURE 12-19

12-3.6 REPLACE WIPER ARM AND LINK 12-3.6

REMOVE WIPER ARM

a. With blades in park position, hold wiper arm away from windshield. Insert cotter pin, MS24665-372, in hole in arm, to lock blade away from windshield surface.

b. Disconnect wiper arm from wiper blade.

c. Remove bolt and washer from end of converter shaft.

d. Loosen wiper arm Allen-head screw. Pull wiper arm from converter shaft.

NOTE

If wiper arm is frozen on converter shaft, slightly spread bottom of arm using a common screwdriver.

INSTALL WIPER ARM

e. Remove cotter pin, MS24665-372, from hole in wiper arm, and install in replacement wiper arm.

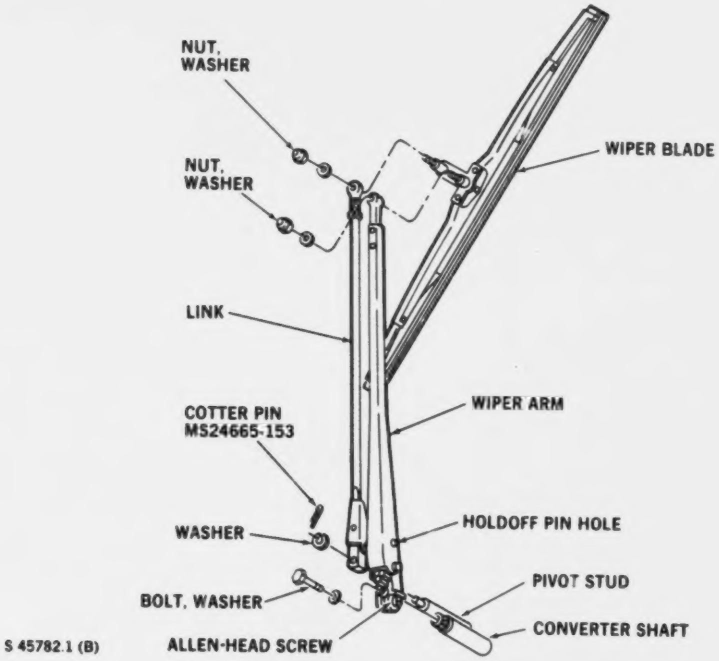

NUT, WASHER
NUT, WASHER
WIPER BLADE
LINK
WIPER ARM
COTTER PIN MS24665-153
WASHER
HOLDOFF PIN HOLE
PIVOT STUD
BOLT, WASHER
CONVERTER SHAFT
S 45782.1 (B)
ALLEN-HEAD SCREW

FIGURE 12-20 (SHEET 1 OF 2)

12-3.6 REPLACE WIPER ARM AND LINK 12-3.6

f. Place wiper arm on converter shaft with wiper arm in parked position, inboard about 40° from centerline of converter. (Alternate method of lining up wiper arm in proper position is a direct line-of-sight from converter shaft to 1 inch above FAT probe on center windshield frame.)

g. Install bolt and washer on converter shaft.

h. Tighten wiper arm Allen-head screw.

i. Lockwire, Item 199, Appendix D, bolt and Allen-head screw to wiper arm.

j. Connect wiper arm to wiper blade.

REMOVE LINK

k. Unpin link from pivot stud.

l. Disconnect link from wiper blade and remove from helicopter.

INSTALL LINK

m. Place link on pivot stud. Install washer and cotter pin, MS24665-153.

n. Connect link to wiper blade.

o. Remove cotter pin, MS24665-372, from hole in wiper arm and ease wiper blade back to windshield.

p. Check wiper arm tension (PARA 12-3.7).

q. Do an operational check (TM 55-1520-237-T).

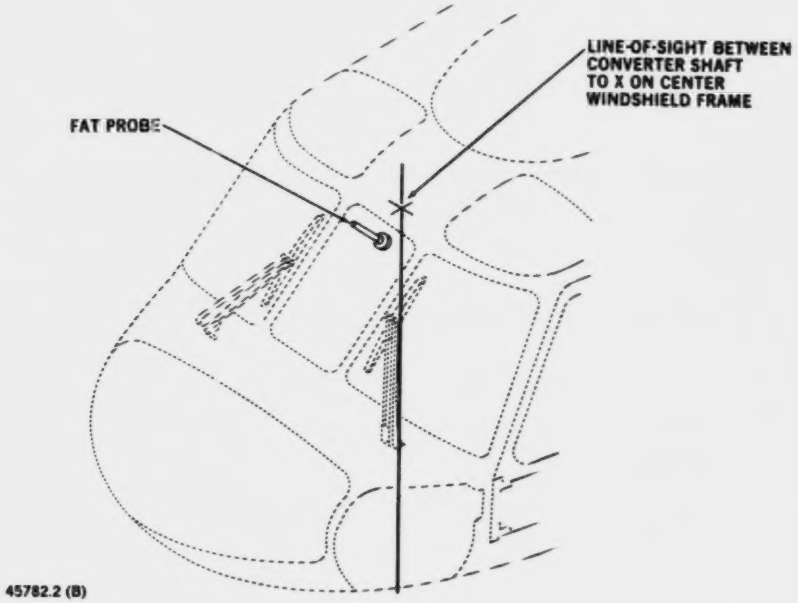

LINE-OF-SIGHT BETWEEN CONVERTER SHAFT TO X ON CENTER WINDSHIELD FRAME
FAT PROBE
45782.2 (B)

FIGURE 12-20 (SHEET 2 OF 2)

12-3.7 ADJUST WIPER ARM PRESSURE 12-3.7

ADJUSTMENT

a. Hook the spring scale under wiper arm at wiper blade attachment point.

b. Check wiper arm pressure. **SCALE READING SHALL BE BETWEEN 4 AND 5 POUNDS AT POINT WHERE WIPER BLADE LEAVES WINDSHIELD.**

c. If adjustment is required, use wrench, XW20509, to turn pressure adjustment screw counterclockwise to increase pressure, or clockwise to decrease pressure.

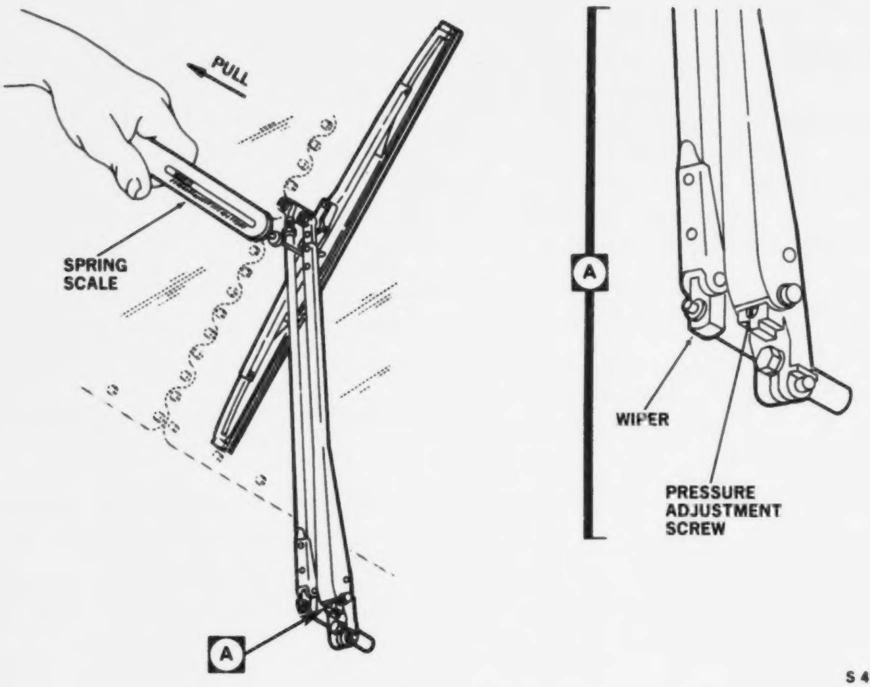

PULL
SPRING SCALE
A
A
WIPER
PRESSURE ADJUSTMENT SCREW
S 45783 (BH4)

FIGURE 12-21

12-4 WINDSHIELD ANTI-ICE SYSTEM 12-4

PARAGRAPH BREAKDOWN

12-4.1	REPLACE WINDSHIELD ANTI-ICE CONTROL UNIT
12-4.2	REPLACE WINDSHIELD ANTI-ICE SWITCH

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68F - Aircraft Electrical Repairer

MATERIALS/PARTS

- Alcohol, Item 73, Appendix D

TOOLS

- Electrical Repairer's Toolkit, SC 5180-99-CL-A06

REFERENCES

- PARA 2-32
- PARA 9-1
- TM 55-1520-237-T

12-4.1 REPLACE WINDSHIELD ANTI-ICE CONTROL UNIT 12-4.1

NOTE

This step applies to both pilot and copilot windshield anti-ice control units. This step also applies to the center windshield anti-ice control unit on UH-60A helicopters serial Nos 85-24441 and subsequent and EH-60A helicopters.

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels from cabin ceiling, left side for copilot's and right side for pilot's windshield anti-ice control unit, between stations 289 and 293 (PARA 2-32). On UH-60A helicopters serial Nos 85-24441 and subsequent and EH-60A helicopters, remove left side of cabin ceiling for center windshield anti-ice control unit between stations 360 and 369 (PARA 2-32).

c. Disconnect electrical connectors from control unit.

d. Remove screws, lockwashers, and washers and remove control unit from bracket.

INSTALL

e. Turn off all electrical power.

f. Clean surface around all mounting holes for good electrical ground contact, using alcohol, Item 73, Appendix D.

g. Fasten windshield anti-ice control unit to bracket with screws, washers, and lockwashers.

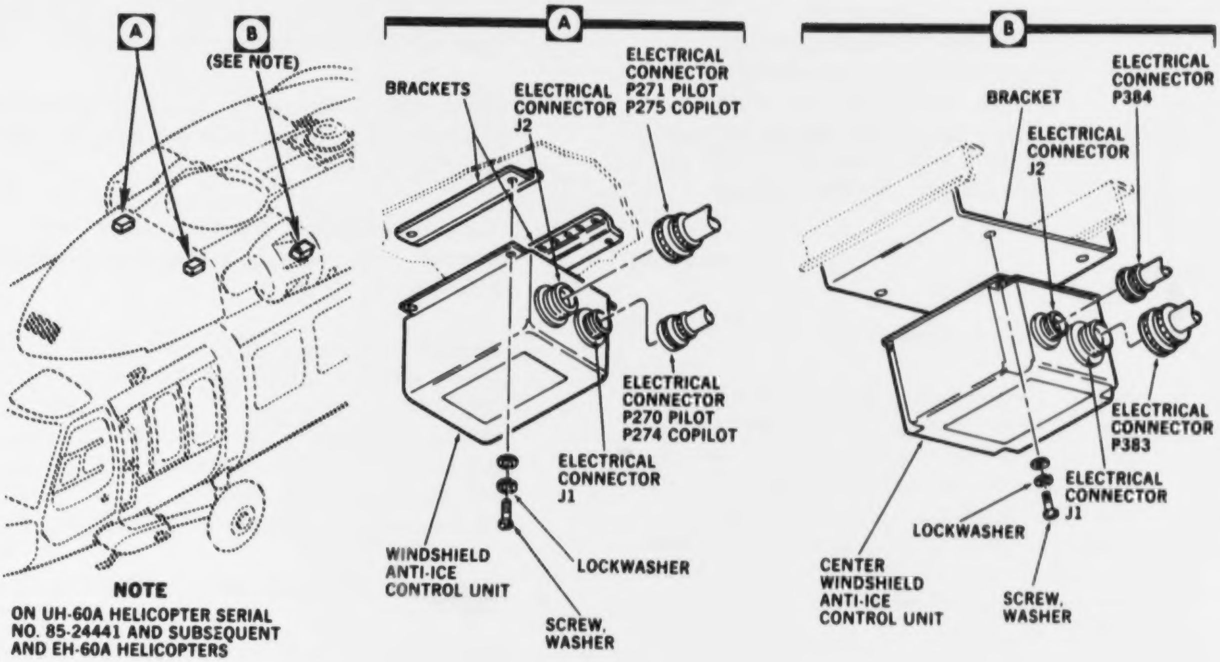
h. Connect electrical connectors, P270 to J1 pilot's, P274 to J1 copilot's, P271 to J2 pilot's, and P275 to J2 copilot's, to control unit. On UH-60A helicopters serial Nos 85-24441 and subsequent and EH-60A helicopters, connect electrical connectors, P383 to J1 and P384 to J2, to center windshield control unit.

i. Do operational check (TM 55-1520-237-T).

j. Make sure area is free of foreign objects before installing soundproofing panels.

k. Install soundproofing panels in cabin ceiling (PARA 2-32).

12-4.1 REPLACE WINDSHIELD ANTI-ICE CONTROL UNIT 12-4.1


A
B
(SEE NOTE)
A
BRACKETS
ELECTRICAL CONNECTOR J2
ELECTRICAL CONNECTOR P271 PILOT P275 COPILOT
ELECTRICAL CONNECTOR P270 PILOT P274 COPILOT
ELECTRICAL CONNECTOR J1
WINDSHIELD ANTI-ICE CONTROL UNIT
LOCKWASHER
SCREW, WASHER
B
BRACKET
ELECTRICAL CONNECTOR P384
ELECTRICAL CONNECTOR J2
ELECTRICAL CONNECTOR P383
ELECTRICAL CONNECTOR J1
LOCKWASHER
CENTER WINDSHIELD ANTI-ICE CONTROL UNIT
SCREW, WASHER

NOTE

ON UH-60A HELICOPTER SERIAL NO. 85-24441 AND SUBSEQUENT AND EH-60A HELICOPTERS

S 45935 (C21)

FIGURE 12-22

12-4.2 REPLACE WINDSHIELD ANTI-ICE SWITCH 12-4.2

REPLACE

On UH-60A helicopters serial Nos 85-24441 and subsequent and EH-60A helicopters, replace pilot's, copilot's, or center windshield anti-ice switch per PARA 9-1.

12-5 ENGINE AIR INLET ANTI-ICE 12-5

PARAGRAPH BREAKDOWN

12-5.1	REPLACE AIR INLET ANTI-ICING VALVE
12-5.2	REPLACE THERMAL SWITCH

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Grommet, MS35489-11
- Lockwire, Item 199, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01

REFERENCES

- TM 55-1520-237-T

12-5.1 REPLACE AIR INLET ANTI-ICING VALVE 12-5.1

REMOVE

a. Turn off all electrical power.

b. Open engine cowling.

c. Remove screws, washers, and cover on engine air inlet. Be careful not to damage temperature sensor tube, when removing cover.

d. Disconnect temperature sensor tube from cover, as follows:

(1) When temperature sensor tube, AE7012G0114-080, is installed, disconnect tube from fitting or cover.

(2) When temperature sensor tube, 70306-10019-041 or 70306-10019-042, is installed, slip tube out of grommet on cover. Replace grommet, if damaged.

e. Disconnect temperature sensing tube from anti-icing valve.

f. Keep tube with cover for installation.

g. Disconnect electrical connector from anti-icing valve.

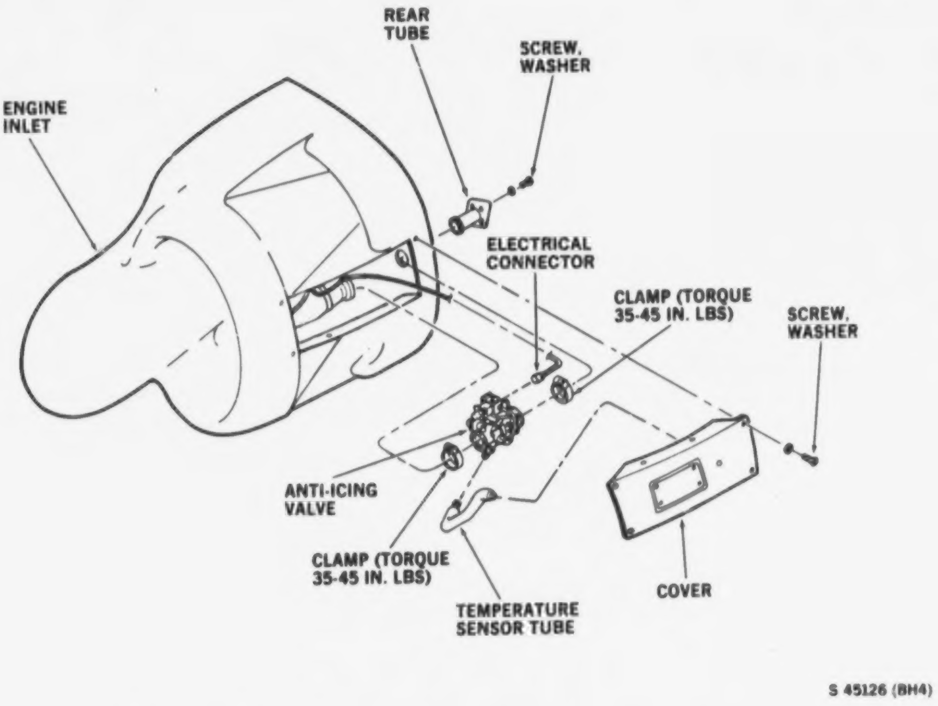

REAR TUBE
SCREW, WASHER
ENGINE INLET
ELECTRICAL CONNECTOR
CLAMP (TORQUE 35-45 IN. LBS)
SCREW, WASHER
ANTI-ICING VALVE
CLAMP (TORQUE 35-45 IN. LBS)
TEMPERATURE SENSOR TUBE
COVER
S 45126 (BH4)

FIGURE 12-23

12-5.1 REPLACE AIR INLET ANTI-ICING VALVE 12-5.1

h. Unclamp anti-icing valve from air inlet tubes.

i. Remove screws, washers, and rear tube from engine air inlet, and remove valve from inlet.

INSTALL

j. Turn off all electrical power.

k. Place anti-icing valve in air inlet and install rear tube with washers and screws.

NOTE

Make sure flow arrow on valve is pointing in direction of airflow.

l. Connect anti-icing valve to air inlet tubes with clamps. **TORQUE CLAMP TO 35 - 45 INCH-POUNDS.**

m. Connect temperature sensor tube as follows:

(1) When temperature sensor tube, AE7012-G0114-080, is installed, connect tube to anti-icing valve and fitting on cover.

(2) When temperature sensor tube, 70306-10019-041 or 70306-10019-042, is installed, connect tube to anti-icing valve. Make sure that end of tube is in position to slip into grommet on cover, when cover is installed.

n. Connect electrical connector to anti-icing valve.

o. Check area to be sure it is free of foreign objects.

p. Install cover on engine air inlet with washers and screws.

q. Close engine cowling.

r. Do an operational check (TM 55-1520-237-T).

12-5.2 REPLACE THERMAL SWITCH 12-5.2

REMOVE

a. Turn off all electrical power.

b. Remove screws and cover on engine air inlet.

c. Disconnect temperature sensor tube from cover, as follows:

(1) When temperature sensor tube, AE7012G0114-080, is installed, disconnect tube from fitting on cover.

(2) When temperature sensor tube, Part No. 70306-10019-041 or -042, is installed, slip tube out of grommet on cover. Replace grommet, if damaged.

d. Disconnect electrical connector from thermal switch.

e. Remove thermal switch from engine air inlet.

INSTALL

f. Turn off all electrical power.

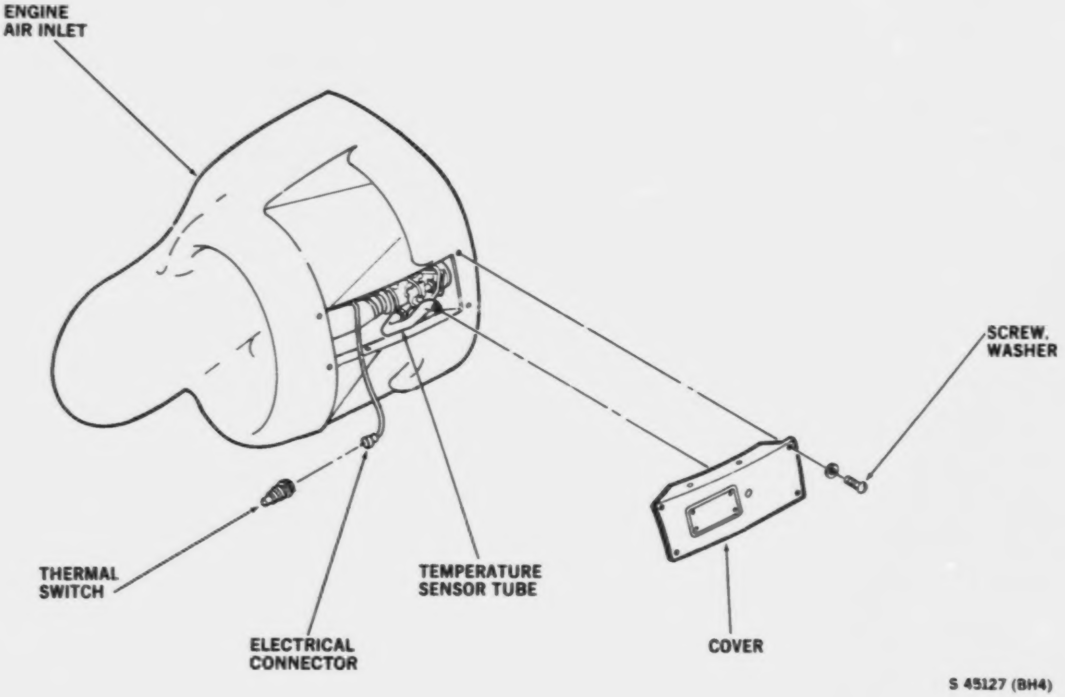

ENGINE AIR INLET
SCREW, WASHER
THERMAL SWITCH
TEMPERATURE SENSOR TUBE
ELECTRICAL CONNECTOR
COVER
S 45127 (BH4)

FIGURE 12-24

12-5.2 REPLACE THERMAL SWITCH 12-5.2

g. Install thermal switch in engine air inlet.

h. Lockwire, Item 199, Appendix D, electrical connector to thermal switch. Connect electrical connector to thermal switch.

i. Check area to be sure it is free of foreign objects.

j. Connect temperature sensor tube to fitting on cover as follows:

(1) When temperature sensor tube, AE7012G0114-080, is installed, connect tube to fitting on cover.

(2) When temperature sensor tube, 70306-10019-041 or 70306-10019-042, is installed, slip tube into grommet on cover.

k. Install cover on engine air inlet with washers and screws.

l. Do an operational check (TM 55-1520-237-T).

12-6 BLADE DEICING SYSTEM 12-6

PARAGRAPH BREAKDOWN

12-6.1 INSTALL
12-6.2 REMOVE
12-6.3 REPLACE FLANGE SEAL AND PACKING
12-6.4 REPLACE TUBE ASSEMBLY AND PACKING
12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY
12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY
12-6.7 REPLACE MAIN ROTOR BLADE DEICE DISTRIBUTOR
12-6.8 REPLACE ICING RATE METER
12-6.9 REPLACE ICING RATE METER LAMPS
12-6.10 REPLACE BLADE DEICE CONTROL PANEL
12-6.11 REPLACE BLADE DEICE CONTROL PANEL TEST-IN-PROGRESS LAMP
12-6.12 REPLACE BLADE DEICE CONTROL PANEL INFORMATION PLATE
12-6.13 REPLACE CONTROL PANEL INFO PLATE LAMPS
12-6.14 REPLACE BLADE DEICE CONTROLLER
12-6.15 REPLACE AUXILIARY JUNCTION BOX
12-6.16 REPLACE CURRENT LIMITER
12-6.17 REPLACE CURRENT LIMITER HOLDER
12-6.18 REPLACE CONTACTOR K60
12-6.19 REPLACE RELAY K61
12-6.20 REPLACE CONTACTOR K62
12-6.21 REPLACE CONTACTOR K63
12-6.22 REPLACE RELAY K64
12-6.23 REPLACE RELAY K65
12-6.24 REPLACE CURRENT TRANSFORMER T10
12-6.25 REPLACE CURRENT TRANSFORMER T14
12-6.26 REPLACE DIODE CR11, CR15, CR16
12-6.27 REPLACE MAIN JUNCTION BOX
12-6.28 REPLACE BLADE DEICE TEST PANEL
12-6.29 REPLACE BLADE DEICE TEST PANEL INDICATOR LAMPS
12-6.30 REPLACE BLADE DEICE TEST PANEL INFORMATION PLATE
12-6.31 REPLACE BLADE DEICE TEST PANEL INFORMATION PLATE LAMPS
12-6.32 REPLACE DEICE OAT SENSOR
12-6.33 REPLACE ICE DETECTOR
12-6.34 REPLACE ICE DETECTOR HOSE ASSEMBLY
12-6.35 REPLACE TAIL ROTOR SLIPRING ROTOR
12-6.36 REPLACE TAIL ROTOR SLIPRING STATOR
12-6.37 REPLACE TAIL ROTOR BLADE DEICE BRUSH ASSEMBLY
12-6.38 REPLACE BRUSHES/BRUSH RETAINER BOARD
12-6.39 REPLACE ELECTRICAL CONNECTOR
12-6.40 REPLACE TAIL ROTOR BLADE DEICE SLIPRING ASSEMBLY
12-6.41 INSPECT TAIL ROTOR BLADE DEICE BRUSHES/RETAINER BOARD
12-6.42 CLEAN/INSPECT TAIL ROTOR BLADE DEICE SLIPRING ASSEMBLY

12-6 BLADE DEICING SYSTEM 12-6

INITIAL SETUP

PERSONNEL REQUIRED

- Two: MOS 68F - Aircraft Electrical Repairer
- One: - Assistant
- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Adhesive, Item 31, Appendix D
- Adhesive Item 42, Appendix D
- Adhesive, Item 49, Appendix D
- Alodine, Item 75, Appendix D
- Anti-Chafing Tape, Item 379, Appendix D
- Brush, Electric, 287511
- Cement, Item 400, Appendix D
- Cheesecloth, Item 98, Appendix D
- Cleaning Compound, Solvent, Item 106, Appendix D
- Cloth, Cleaning, Item 111, Appendix D
- Corrosion Preventive Compound, Item 123, Appendix D
- Corrosion Preventive Compound, Item 124, Appendix D
- Cotter Pin, MS24665-306
- Degreasing Solvent, Item 131, Appendix D
- Detergent, Item 425, Appendix D
- Dry-Cleaning Solvent, Item 135, Appendix D
- Epoxy Coating, Item 148, Appendix D
- Gasket, 287526
- Gasket, 287524
- Grommet, MS21266-1N
- Grommet, MS35489-9
- Grommet, MS35489-13
- Insulation Sleeving, Item 179, Appendix D
- Insulation Sleeving, Heat-Shrinkable, Item 180, Appendix D
- Insulation Sleeving, Heat-Shrinkable, Item 181, Appendix D
- Insulation Sleeving, Item 187, Appendix D
- Lockwire, Item 198, Appendix D
- Lockwire, Item 199, Appendix D
- Lockwire, Item 203, Appendix D
- Lubricating Oil, Item 221, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Packing, MS9068-018
- Packing, MS9068-026

- Packing, M83248/1-126
- Packing, M83248/1-227
- Packing, M83248/1-234
- Packing, M83248/1-263
- Packing, 29579-2
- Primer, Item 272, Appendix D
- Primer, Item 274, Appendix D
- Primer, Item 277, Appendix D
- Sealing Compound, Item 312, Appendix D
- Solder, Item 328, Appendix D
- Tiedown Straps, Item 360, Appendix D
- Tubing, Plastic, Spiral, Item 379, Appendix D
- Wooden Spatula, Item 386, Appendix D.

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Blade Handling Pole, 70700-20395-041
- Brush, Paint, H-B491
- Crimping Tool, RR-G-619
- Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Hand Drill, GGG-D-671
- Drill Set, GGG-D-00751
- Heat Gun, MIL-H-45193
- Insertion/Extraction Tool, M81969/14-04
- Mounting Plate, TC92
- Multimeter, AN-USM223
- Nonmetallic Scraper, Locally-Made
- Sandbag
- Soldering Set, TL905U
- Spring Tester, J9666
- Tags
- Torque Wrench, 0 - 30 in.lbs, GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs, GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs, GGG-W-00686
- Torque Wrench, 700 - 1600 in. lbs, GGG-W-00686
- Wood, 2' x 3-1/2' x 55'
- Vacuum Cleaner, 15-A1080

12-6 BLADE DEICING SYSTEM 12-6

REFERENCES

- PARA 1-4.1
- PARA 1-6.3
- PARA 2-5
- PARA 2-23
- PARA 2-29
- PARA 2-34
- PARA 2-35
- PARA 2-36
- PARA 2-56
- PARA 5-5
- PARA 5-18
- PARA 5-23
- PARA 5-26
- PARA 6-1
- PARA 6-25
- PARA 6-29
- TM 38-230-1
- TM 43-0105
- TM 55-1500-335-23
- TM 55-1500-204-25/1
- TM 55-1500-323-25
- TM 55-1500-345-23
- TM 55-1520-237-T

12-6.1 INSTALL 12-6.1

PREPARE HELICOPTER FOR INSTALLATION

a. Turn off all electrical power.

b. Remove troop seats from cabin (PARA 2-23).

c. Remove both troop seat support tubes (PARA 2-23).

d. Remove soundproofing from right cabin ceiling between stations 247 and 398, buttline 0, and right edge of cabin (PARA 2-32).

e. Remove main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

f. Remove soundproofing from right stowage compartment (PARA 2-32).

g. Remove cargo netting from right side rear stowage compartment.

h. Release fasteners on intermediate gear box cover, 5T-6T-17, and remove cover from helicopter (PARA 2-56).

i. Remove screws, washers, and access panels, 5T-5B-18, and 6T-6B-32.

CAUTION

To keep covers from being damaged by wind, make sure they are secured when hinged open.

j. Release fasteners, and hinge open pylon driveshaft cover, 5T-6T-11.

k. Release fasteners, and remove front tail gear box cover, 5T-6T-12.

l. If necessary cut grommet, MS21266-1N, to length for sump bracket. Apply coat of adhesive, Item 49, Appendix D, to grommet and sump bracket. Allow adhesive to air-dry for 10 minutes, until it becomes tacky. Firmly press grommet in place. Allow to cure for 24 hours.

m. If necessary drill 0.205-inch hole in rear tail gear box fairing using hand drill with a No. 5 twist drill bit. See Figure 12-39, Sheet 1, for dimensions.

n. If necessary drill 0.205-inch hole in flange at station 327, bulkhead at station 351, and in stringer at station 316 (Figure 12-31, Sheet 1, Detail A), using hand drill with a No. 5 twist drill bit.

o. Prepare areas around holes for grounding as follows:

(1) Clean paint from area with file or scraper.

(2) Clean area with a clean cloth dampened with dry-cleaning solvent, Item 135, Appendix D.

(3) Apply alodine, Item 75, Appendix D, to exposed area (TM 43-0105).

p. Engage gust lock.

MAIN GEAR BOX MODIFICATION

q. Drain gear box (PARA 6-1).

r. Remove nuts, washers, and main rotor shaft access cover from sump (Figure 12-25, Sheet 1). Store access cover. Discard packing.

s. Place piece of wood 2' x 3-1/2' x 55' inside main rotor shaft. Tap end of wood with hammer until plug at top of shaft is unseated.

12-6.1 INSTALL 12-6.1

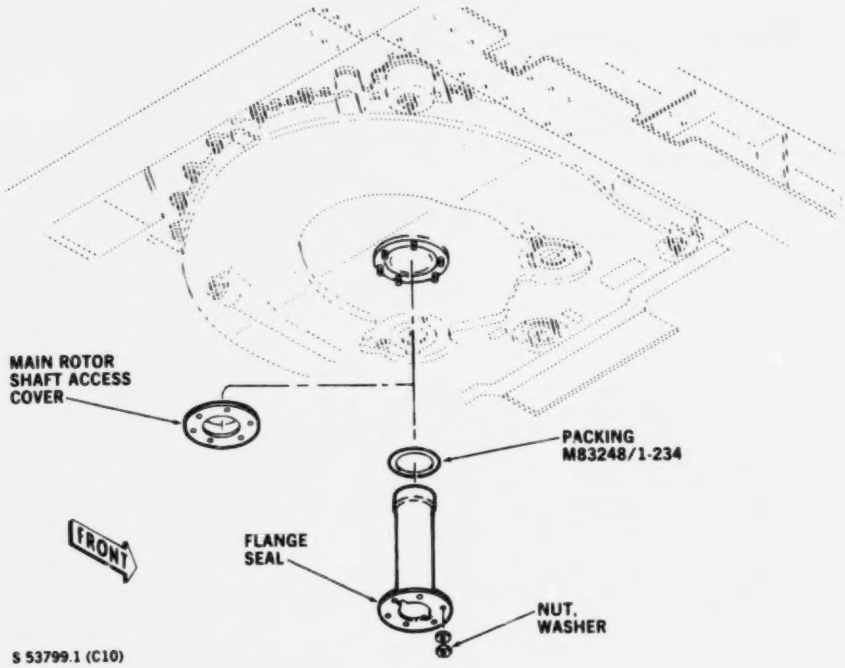

MAIN ROTOR
SHAFT ACCESS
COVER
PACKING
M83248/1-234
FRONT
FLANGE
SEAL
NUT,
WASHER
S 53799.1 (C10)

FIGURE 12-25 (SHEET 1 OF 5)

t. Place packing, M83248/1-234, lubricated with lubricating oil, Item 221, Appendix D, on flange seal.

u. Install flange seal with packing on sump with washers and nuts. Handtighten nuts now.

v. Remove bolts, washers, and bifilar cover from main rotor head. Store bifilar cover, bolts, and washers.

w. Remove main rotor shaft plug from inside shaft extension.

x. Install new packing, M83248/1-227, lubricated with lubricating oil, Item 221, Appendix D, on tube.

12-6.1 INSTALL

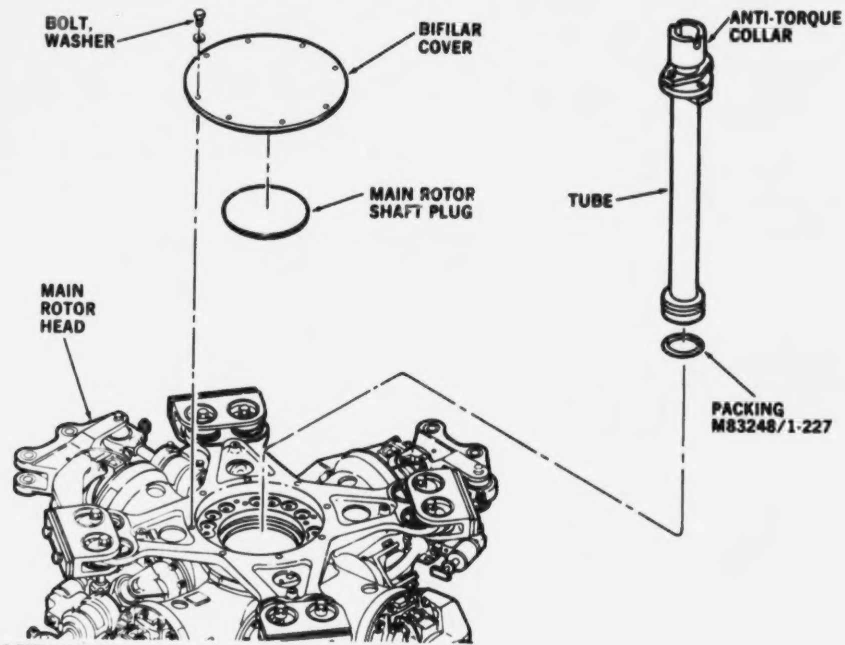

BOLT, WASHER
BIFILAR COVER
ANTI-TORQUE COLLAR
MAIN ROTOR SHAFT PLUG
TUBE
MAIN ROTOR HEAD
PACKING M83248/1-227
S 53799.2 (C10)

FIGURE 12-25 (SHEET 2 OF 5)

y. Place tube into main rotor shaft with anti-torque collar up.

z. Turn tube until ears on bottom of tube line up with slots on flange seal, and push down until seated.

aa. Loosen nuts on distributor terminal board and mate distributor to slipring.

ab. Install distributor on slipring with bolts and washers. **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.** Tighten nuts on distributor terminal board.

ac. Install packing, M83248/1-126, lubricated with lubricating oil, Item 221, Appendix D, on slipring.

ad. Feed wire bundle from slipring through tube.

ae. Line up anti-torque pin on slipring with slot on anti-torque collar of tube.

12-6.1 INSTALL 12-6.1

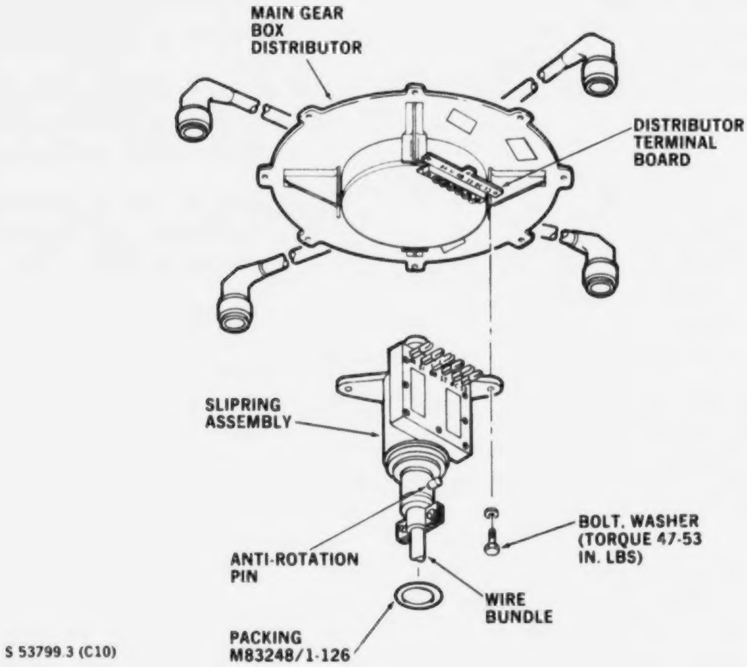

MAIN GEAR BOX DISTRIBUTOR
DISTRIBUTOR TERMINAL BOARD
SLIPRING ASSEMBLY
BOLT, WASHER (TORQUE 47-53 IN. LBS)
ANTI-ROTATION PIN
WIRE BUNDLE
PACKING M83248/1-126
S 53799.3 (C10)

FIGURE 12-25 (SHEET 3 OF 5)

af. Check area for cleanness.

ag. Install distributor on bifilar with bolts and washers. Handtighten bolts now.

ah. Install clamps on rotor deice harness. Clamp harness on distributor with bolts, washers, and clamps. **TORQUE ALL DISTRIBUTOR BOLTS TO 105 - 116 INCH-POUNDS.**

ai. Remove and store caps from electrical connectors on main rotor blades.

NOTE

Rotor blade deice system, modified by MWO 55-1520-237-50-36, requires installation of packing and heat-shrinkable insulation sleeving at main rotor blade connectors.

12-6.1 INSTALL 12-6.1

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

aj. Install heat-shrinkable insulation sleeving, Item 181, Appendix D, on harness at main rotor connectors as follows:

(1) Clean hard epoxy back of connector shell and about 3 to 3-1/2 inches of convoluted harness with a clean cloth, dampened with methyl ethyl ketone, Item 233, Appendix D.

(2) Place 2-inch long sleeving on connector and harness, 1/8 inch from band. Heat-shrink sleeving using heater gun (TM 55-1500-323-25).

(3) Place 2-3/4-inch long sleeving over 2 inch piece. Heat-shrink sleeving (TM 55-1500-323-25).

ak. Clean inside of electrical connectors, P841, P842, P843, and P844, with solvent cleaning compound, Item 106, Appendix D.

al. Apply a thin coat of corrosion preventive compound, Item 123, Appendix D, inside electrical connectors, P841, P842, P843, and P844.

am. Connect distributor electrical connectors, P841, P842, P843, and P844, to main rotor blades, using packing, MS9068-026.

an. Apply a coat of corrosion preventive compound, Item 124, Appendix D, on electrical connectors, P841, P842, P843, and P844.

ao. Remove bolts, washers, and anti-flap stop.

ap. Remove bolts from spindle bearing endplates. Clean primer from countersunk washers with methyl ethyl ketone, Item 233, Appendix D, and store washers for future use.

aq. Before torquing spindle attachment bolts, check threaded insert that these bolts go into, as follows:

(1) Thread each bolt with washer until head of bolt is 0.030 inch away from surface of washer. Using dial-type torque wrench, unthread bolts. **MINIMUM BREAKAWAY TORQUE IS 14 INCH-POUNDS. MAXIMUM REMOVAL TORQUE IS 150 INCH-POUNDS.** If torque is not within these limits, check condition of bolts for corrosion and wear. If corrosion or wear is evident, try a new bolt. Check insert for cleanness. If insert is dirty, clean with cheesecloth moistened with methyl ethyl ketone, Item 233, Appendix D. If breakaway or removal torque is still not acceptable, replace insert (PARA 5-5).

12-6.1 INSTALL

ar. Coat threads, shank, and area under head of bolts with primer, Item 277, Appendix D.

NOTE

Make certain top bracket is in a vertical position before torquing, to avoid preloading the heater cable.

as. Install brackets on spindle bearing endplates with bolts while primer is still wet. Make sure countersunk side of bracket is next to bolthead. **TORQUE BOLTS TO 912 - 1008 INCH-POUNDS.**

at. Seal boltheads with sealing compound, Item 312, Appendix D. Touch up paint on boltheads as required (PARA 2-5).

au. Install anti-flap stop with bolts and washers. **TORQUE BOLTS TO 181 - 199 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts. Cover lockwire with insulation sleeving, Item 187, Appendix D.

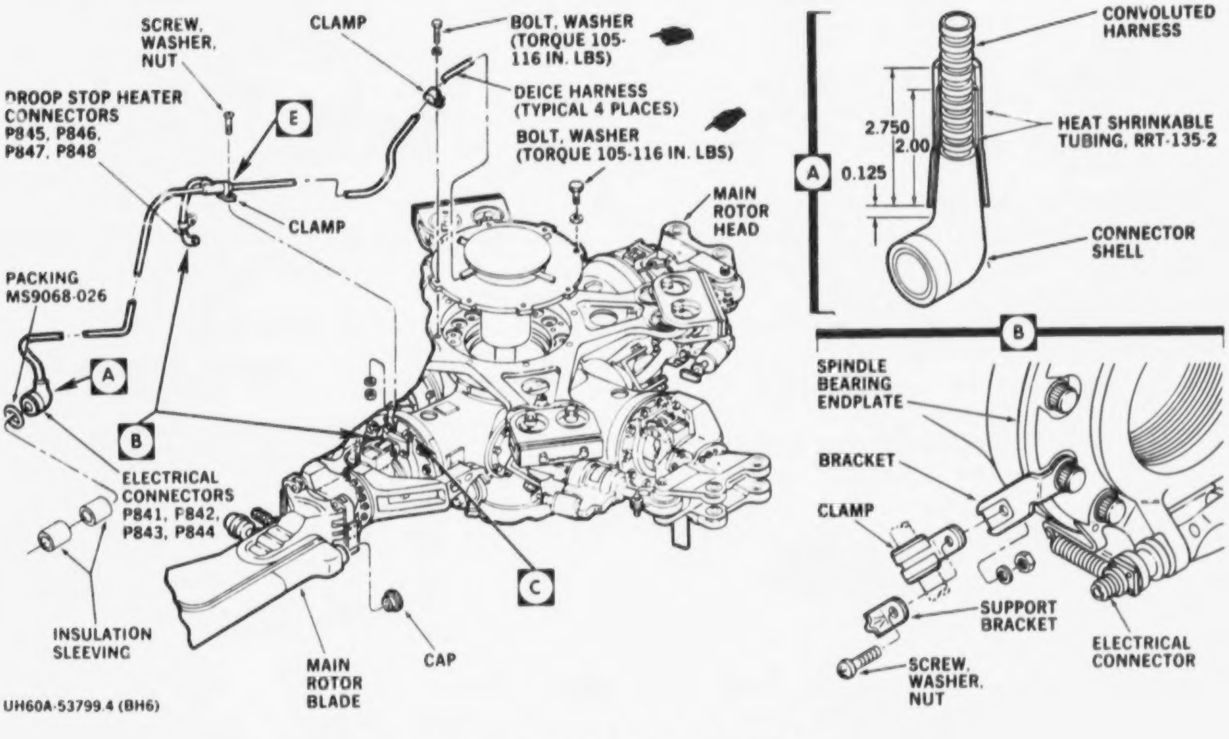

SCREW, WASHER, NUT
CLAMP
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DROOP STOP HEATER CONNECTORS P845, P846, P847, P848
E
DEICE HARNESS (TYPICAL 4 PLACES)
BOLT, WASHER (TORQUE 105-116 IN. LBS)
CLAMP
MAIN ROTOR HEAD
PACKING MS9068-026
A
B
ELECTRICAL CONNECTORS P841, F842, P843, P844
INSULATION SLEEVING
C
MAIN ROTOR BLADE
CAP
UH60A-53799.4 (BH6)
CONVOLUTED HARNESS
2.750
2.00
0.125
A
HEAT SHRINKABLE TUBING, RRT-135-2
CONNECTOR SHELL
B
SPINDLE BEARING ENDPLATE
BRACKET
CLAMP
SUPPORT BRACKET
SCREW, WASHER, NUT
ELECTRICAL CONNECTOR

FIGURE 12-25 (SHEET 4 OF 5)

av. Install harnesses on spindle brackets with screws, washers, nuts, and clamps.

NOTE

When fastening cable, avoid distorting bracket.

aw. Install droop stop heater pins by doing this:

(1) Raise blade until spindle is off droop stop cam.

(2) Disconnect springs from spring pins.

(3) Remove cotter pin.

(4) Push old pin out of droop stop with heater pin.

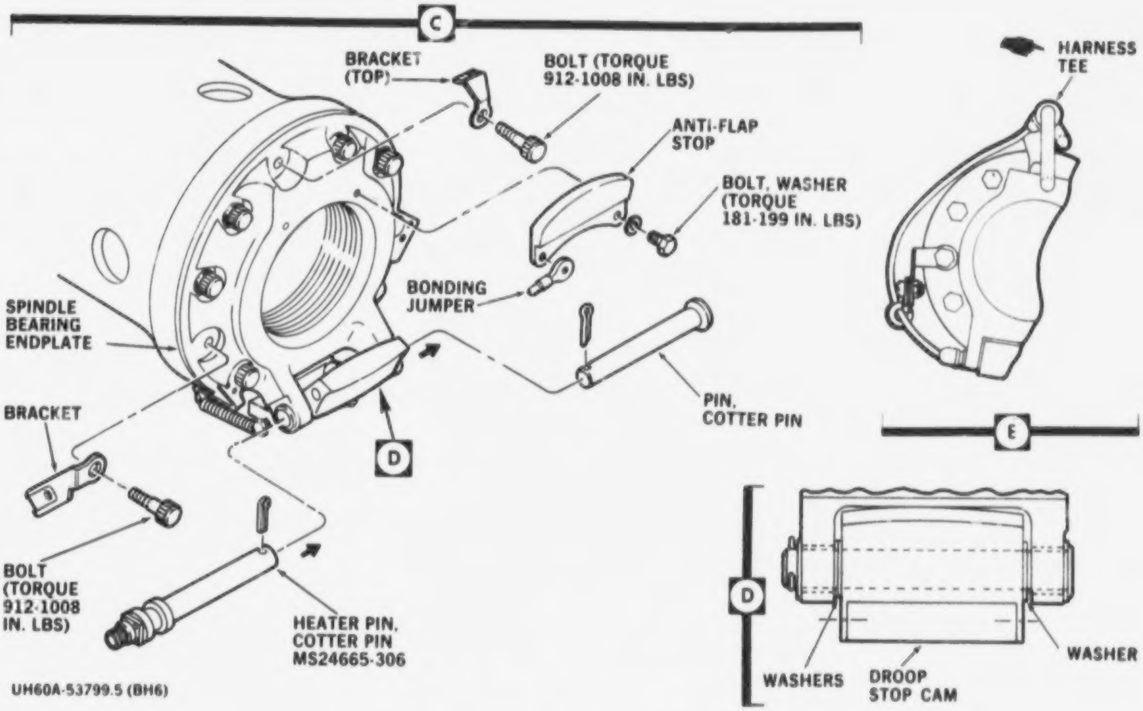

C
BRACKET (TOP)
BOLT (TORQUE 912-1008 IN. LBS)
ANTI-FLAP STOP
BOLT, WASHER (TORQUE 181-199 IN. LBS)
BONDING JUMPER
SPINDLE BEARING ENDPLATE
BRACKET
PIN, COTTER PIN
D
BOLT (TORQUE 912-1008 IN. LBS)
HEATER PIN, COTTER PIN MS24665-306
UH60A-53799.5 (BH6)
HARNESS TEE
E
D
WASHERS
DROOP STOP CAM
WASHER

FIGURE 12-25 (SHEET 5 OF 5)

NOTE

Head of pin will be towards trailing edge of blade.

(5) Install droop stop heater harness electrical connectors, P845, P846, P847, and P848, on droop stop heater pins.

(6) Lower blade onto droop stop.

(7) Install cotter pin, MS24665-306.

(8) Connect springs on spring pins.

NOTE

Make sure harness tee is mounted in downward position for maximum protection of harness. (Figure 12-25, Sheet 4, Detail E).

ax. Install harness and droop stop heaters on all four main rotor blades.

ay. Remove blade handling pole.

az. Feed slipring harness through sump bracket.

ba. Install 18-inch length of plastic spiral tubing, Item 379, Appendix D, around harness so one end will be even with bottom of sump when harness is installed.

bb. Install both sump brackets on flange seal in transmission sump with nuts and washers. **TORQUE ALL FLANGE SEAL NUTS TO 95 - 105 INCH-POUNDS.**

bc. Install harness on sump bracket with clamp and screw.

bd. Install harness on sump at oil pump with kit screw, washer, spacer, and clamp. Make sure clamp secures plastic spiral tubing on harness. Leave enough slack in harness in sump area so that distributor and slipring may be raised enough to get at slipring when clamps on sump are removed.

be. Install grommet, MS35489-13, at main transmission beam, station 340, buttline 16.5 (right), and feed harness through it.

bf. Apply bead of sealing compound, Item 312, Appendix D around wiring harness, where it passes through grommet, MS35489-13.

bg. Feed harness through bulkhead at station 327, buttline 20. Clamp to side of hole with kit clamp, screw, washer, and nut.

bh. Service main transmission (PARA 1-4.1).

12-6.1 INSTALL 12-6.1

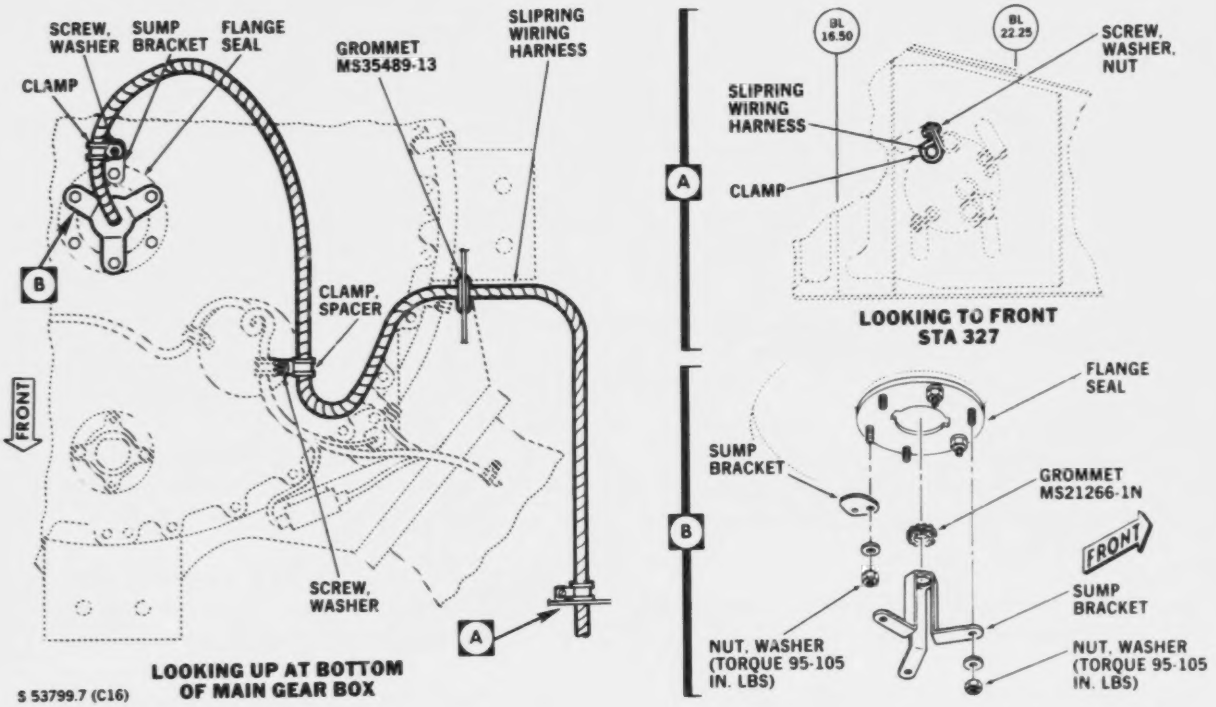

SCREW, WASHER
SUMP BRACKET
FLANGE SEAL
CLAMP
GROMMET MS35489-13
SLIPRING WIRING HARNESS
B
CLAMP, SPACER
FRONT
SCREW, WASHER
A
LOOKING UP AT BOTTOM OF MAIN GEAR BOX
S 53799.7 (C16)
BL 16.50
BL 22.25
SCREW, WASHER, NUT
SLIPRING WIRING HARNESS
A
CLAMP
LOOKING TO FRONT STA 327
FLANGE SEAL
SUMP BRACKET
GROMMET MS21266-1N
B
FRONT
SUMP BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
NUT, WASHER (TORQUE 95-105 IN. LBS)

FIGURE 12-25 (SHEET 5 OF 5)

ICING RATE METER

bi. Loosen fasteners on dummy plate (Figure 12-26).

bj. Lift dummy plate from instrument panel until electrical connector is exposed.

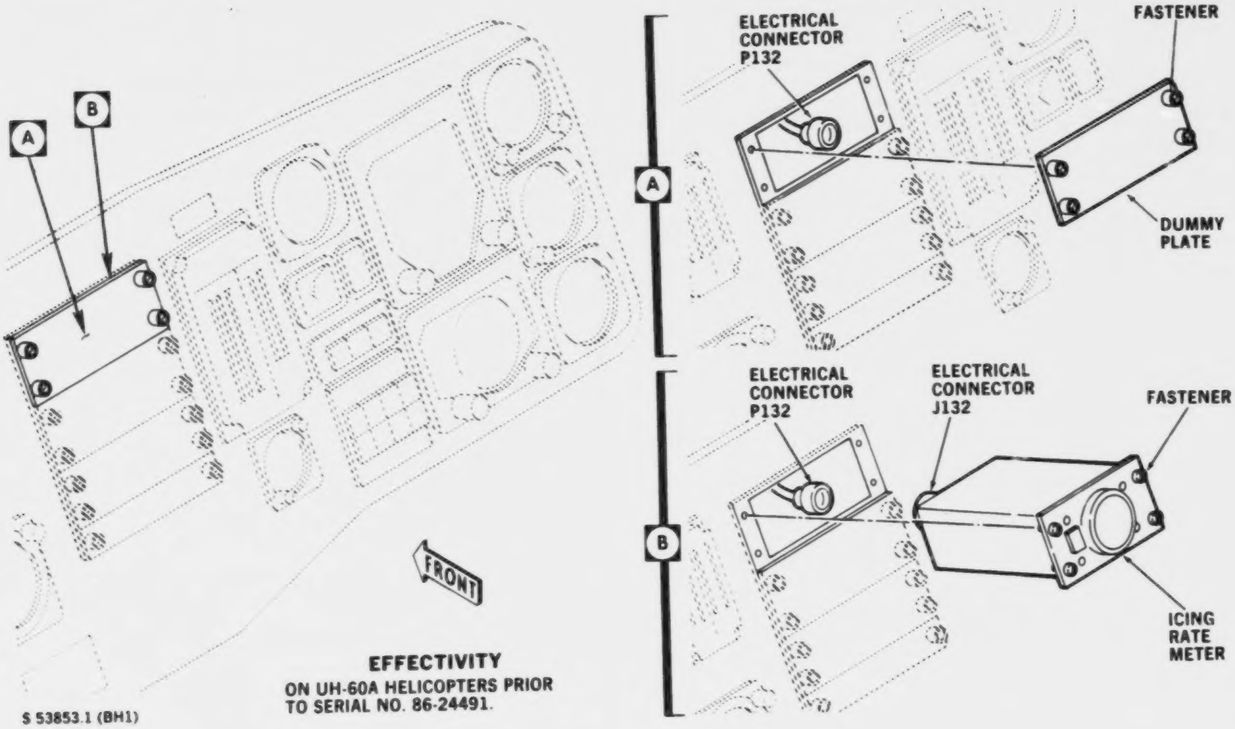
bk. Disconnect electrical connector, P132, from dummy plate.

bl. Connect electrical connector, P132, to electrical connector, J132, on icing rate meter.

bm. Make sure area is free of foreign objects before placing meter into instrument panel.

bn. Carefully place meter into instrument panel and install with fasteners.

12-6.1 INSTALL

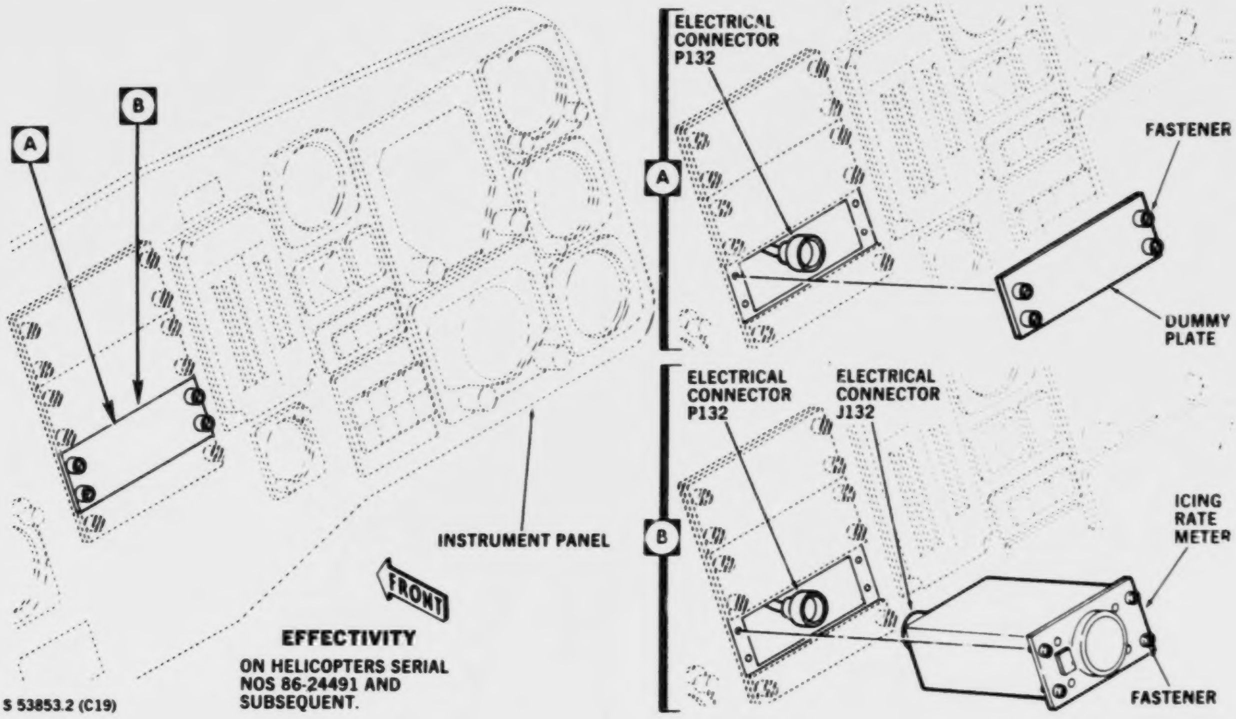

A
B
ELECTRICAL
CONNECTOR
P132
FASTENER
DUMMY
PLATE
A
ELECTRICAL
CONNECTOR
P132
ELECTRICAL
CONNECTOR
J132
FASTENER
B
ICING
RATE
METER
FRONT
S 53853.1 (BH1)

EFFECTIVITY

ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 86-24491.

FIGURE 12-26 (SHEET 1 OF 2)

12-6.1 INSTALL 12-6.1


A
B
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P132
A
FASTENER
DUMMY PLATE
ELECTRICAL CONNECTOR P132
ELECTRICAL CONNECTOR J132
B
ICING RATE METER
FASTENER

EFFECTIVITY

ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.

S 53853.2 (C19)

FIGURE 12-26 (SHEET 2 OF 2)

12-6.1 INSTALL

BLADE DEICE CONTROL PANEL

bo. Loosen fasteners on dummy plate (Figure 12-27, Sheet 1 and Sheet 2).

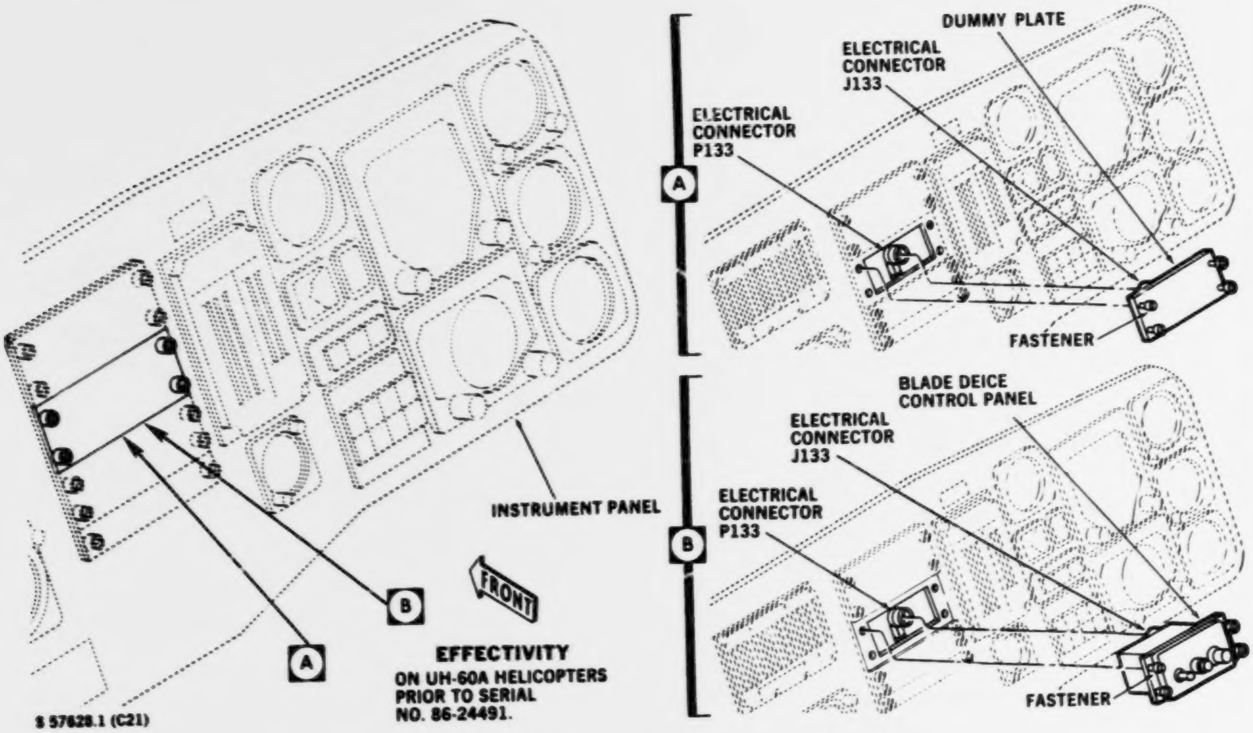
bp. Lift dummy plate from instrument panel until electrical connector is exposed.

bq. Disconnect electrical connector, P133, from dummy plate.

br. Connect electrical connector, P133, to electrical connector, J133, on blade deice control panel.

bs. Make sure area is free from foreign objects before placing control panel into instrument panel.

bt. Carefully place control panel into instrument panel and install with fasteners.


DUMMY PLATE
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
A
FASTENER
BLADE DEICE CONTROL PANEL
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
B
FASTENER
INSTRUMENT PANEL
FRONT
B
A
S 57628.1 (C21)

EFFECTIVITY
ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 86-24491.

FIGURE 12-27 (SHEET 1 OF 2)

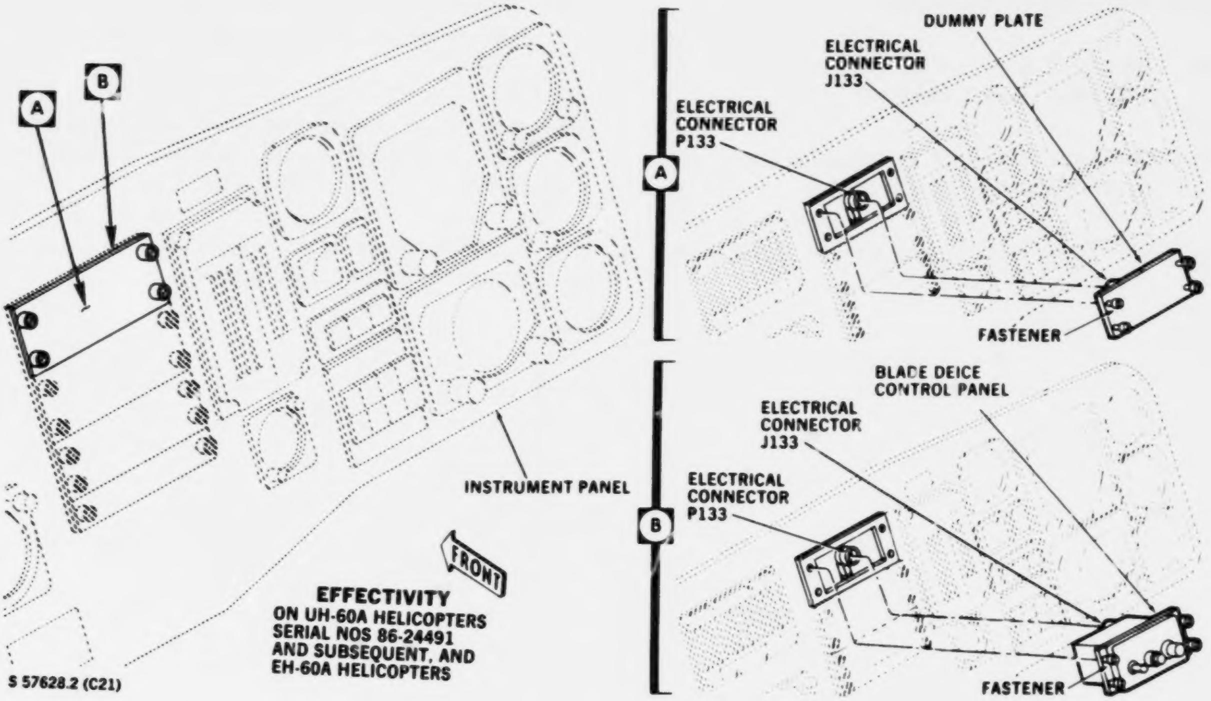

A
B
INSTRUMENT PANEL
FRONT
EFFECTIVITY
ON UH-60A HELICOPTERS
SERIAL NOS 86-24491
AND SUBSEQUENT, AND
EH-60A HELICOPTERS
S 57628.2 (C21)
DUMMY PLATE
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
A
FASTENER
BLADE DEICE CONTROL PANEL
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
B
FASTENER

FIGURE 12-27 (SHEET 2 OF 2)

BLADE DEICE TEST PANEL

bu. Loosen fasteners on dummy plate (Figure 12-28).

bv. Lift dummy plate from instrument panel until electrical connector is exposed.

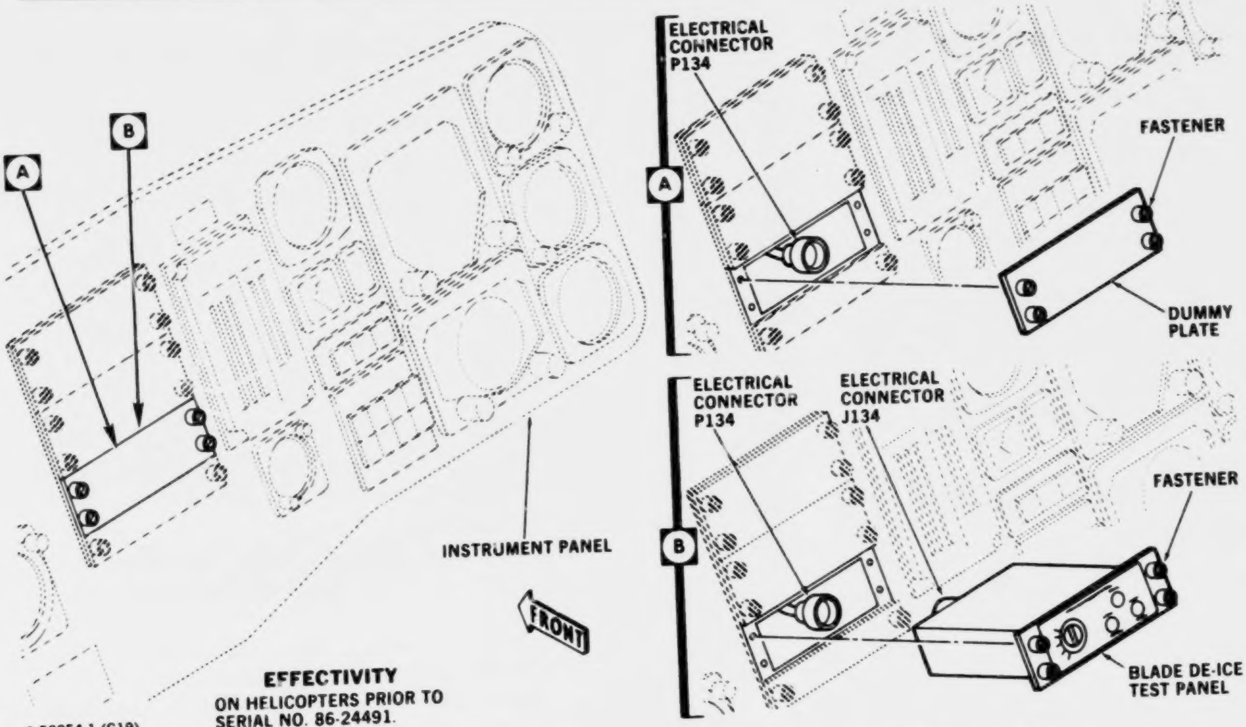
bw. Disconnect electrical connector, P134, from dummy plate.

bx. Connect electrical connector, P134, to electrical connector, J134, on blade deice test panel.

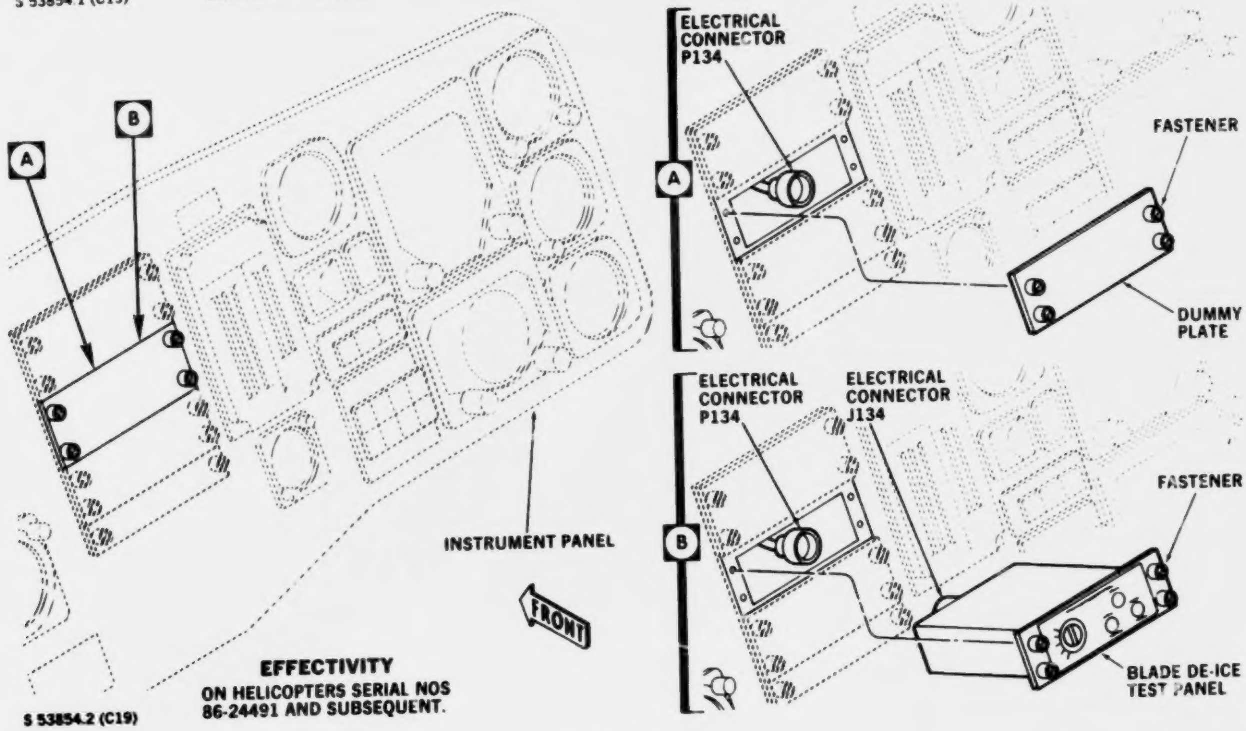
by. Make sure area is free from foreign objects before placing test panel into instrument panel.

bz. Carefully place test panel into instrument panel and install with fasteners.

12-6.1 INSTALL 12-6.1


A
B
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P134
A
FASTENER
DUMMY PLATE
ELECTRICAL CONNECTOR P134
ELECTRICAL CONNECTOR J134
B
FASTENER
BLADE DE-ICE TEST PANEL
S 53854.1 (C19)

EFFECTIVITY
ON HELICOPTERS PRIOR TO SERIAL NO. 86-24491.


A
B
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P134
A
FASTENER
DUMMY PLATE
ELECTRICAL CONNECTOR P134
ELECTRICAL CONNECTOR J134
B
FASTENER
BLADE DE-ICE TEST PANEL
S 53854.2 (C19)

EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.

FIGURE 12-28

12-6.1 INSTALL 12-6.1

AUXILIARY AC JUNCTION BOX

ca. At station 348, left buttline 20, waterline 267, remove wires from terminal board, No. 15 (Figure 12-29).

cb. Unfasten and hang auxiliary ac junction box cover by chain.

cc. Feed junction box feeder harness through grommet in aux ac deice junction box, to AC CURRENT LIMITERS MN RTR. Connect wires with screws and washers as follows (Figure 12-33, Sheet 2):

WIRE CODE		LIMITERS MN RTR
H6431A10A	TO	CL10
H6432A10B	TO	CL11
H6433A10C	TO	CL12

cd. Install auxiliary ac junction box with screws and washers.

ce. Carefully insert paired wires through junction box grommets marked A, B, and C.

cf. Using nuts and washers, connect wires to terminal board, No. 5, as follows:

GROMMET	WIRE CODE	TO	TERMINAL NO.
A	X8D06A		1
A	X8E06A		1
B	X9D06B		3
B	X9E06B		3
C	X10D06C		5
C	X10E06C		5

cg. Route wires, No. H6434A20N, No. H6434B20N, and No. H6435A20N, out of unmarked junction box grommet.

ch. Make sure airframe ground on station 352 is clean for good electrical connection.

ci. Connect wires, No. H6435A20N, No. H6434A20N, and No. H6434B20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

cj. Touch up paint ground (PARA 2-5).

ck. Install cover on junction box with fasteners.

12-6.1 INSTALL 12-6.1

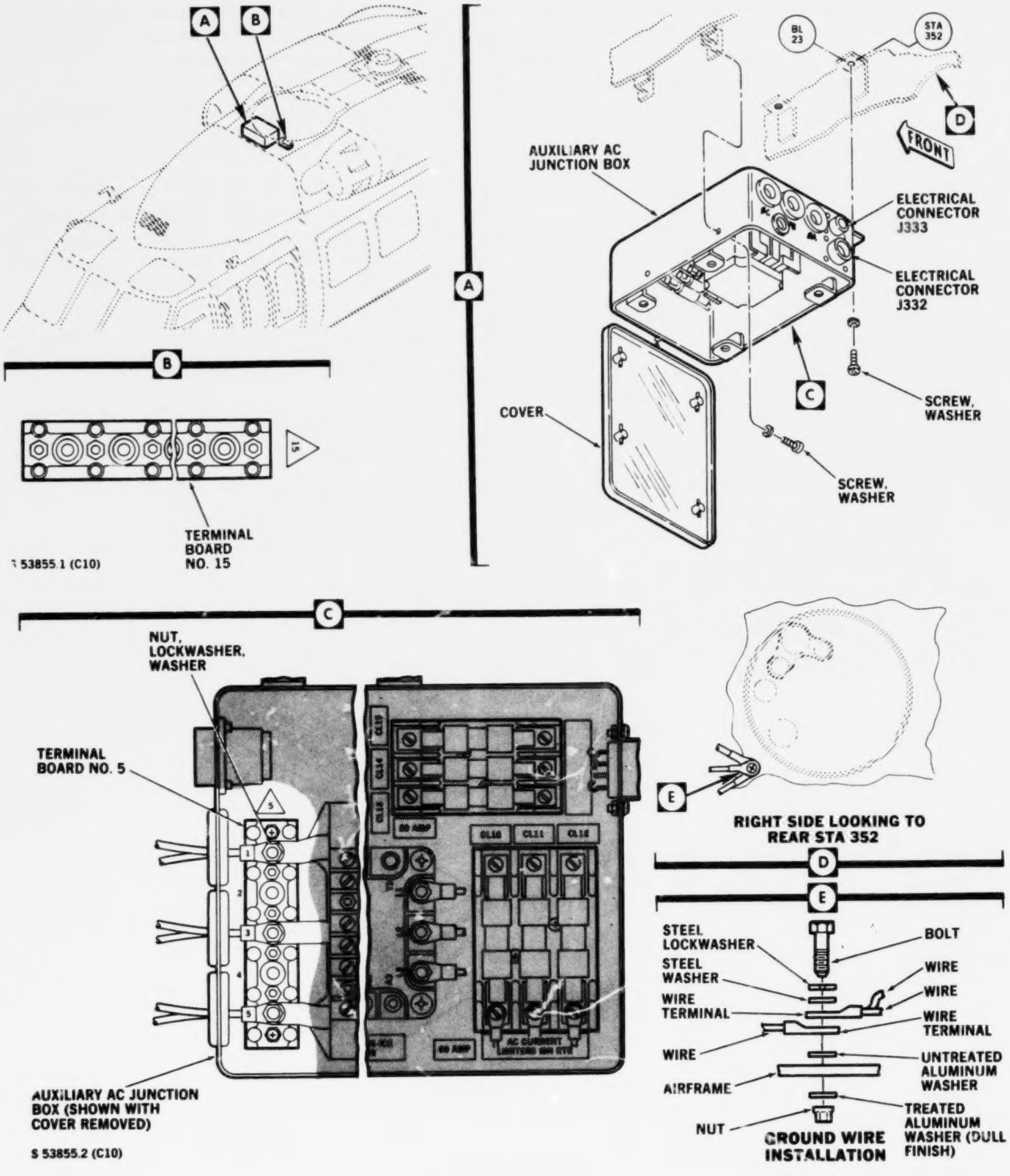

A
B
BL 23
STA 352
D
FRONT
AUXILIARY AC JUNCTION BOX
ELECTRICAL CONNECTOR J333
ELECTRICAL CONNECTOR J332
A
C
SCREW, WASHER
COVER
SCREW, WASHER
B
15
TERMINAL BOARD NO. 15
S 53855.1 (C10)
C
NUT, LOCKWASHER, WASHER
TERMINAL BOARD NO. 5
5
AUXILIARY AC JUNCTION BOX (SHOWN WITH COVER REMOVED)
S 53855.2 (C10)
E
RIGHT SIDE LOOKING TO REAR STA 352
D
E
STEEL LOCKWASHER
BOLT
STEEL WASHER
WIRE
WIRE
WIRE TERMINAL
WIRE TERMINAL
WIRE
UNTREATED ALUMINUM WASHER
AIRFRAME
TREATED ALUMINUM WASHER (DULL FINISH)
NUT
GROUND WIRE INSTALLATION

FIGURE 12-29

BLADE DEICE CONTROLLER AND NAMEPLATE

cl. At station 342, buttline 23 (right), waterline 266, locate mounting bracket for blade deice controller.

cm. Apply nameplate, if necessary, as follows:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Clean deice controller mounting bracket front surface area with methyl ethyl ketone, Item 233, Appendix D.

(2) Peel paper backing from bonding film on back of nameplate.

(3) Moisten entire surface of adhesive with methyl ethyl ketone, Item 233, Appendix D. Do not soak or saturate surface. Allow extra solvent to evaporate (about 30 seconds) until surface appears dull.

(4) Press or rub nameplate onto position on front of bracket.

cn. Install blade deice controller on mounting bracket with screws, lockwashers, and washers.

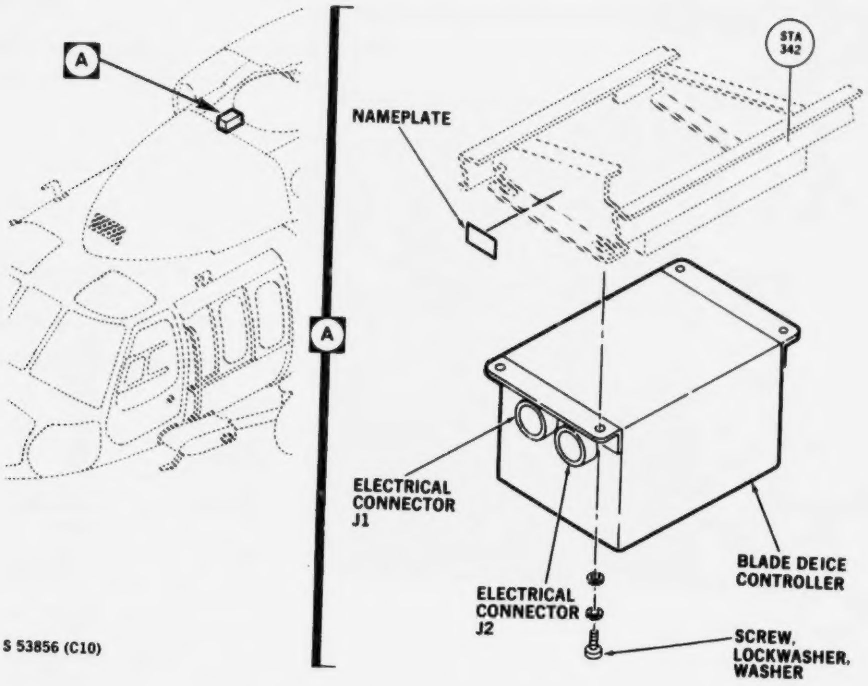

A
NAMEPLATE
STA 342
A
ELECTRICAL CONNECTOR J1
ELECTRICAL CONNECTOR J2
BLADE DEICE CONTROLLER
SCREW, LOCKWASHER, WASHER
S 53856 (C10)

FIGURE 12-30

MAIN ROTOR BLADE DEICE JUNCTION BOX

co. At station 326, buttline 28 (right), install main rotor blade junction box with screws and washers (Figure 12-31, Sheet 1).

cp. Unfasten and hang junction box cover by chain.

cq. Install slipring wiring harness on stringer with clamp, screw, washer, and nut (Figure 12-33, Sheet 1).

cr. Carefully insert slipring wires through grommet in junction box.

cs. Using nuts and washers, connect wires to terminal board, No. 3, as follows:

WIRE CODE	TERMINAL NO.
1-20-S2	1
1-10-A	2
1-20-S1	3
1-10-B	4
1-10-C	5

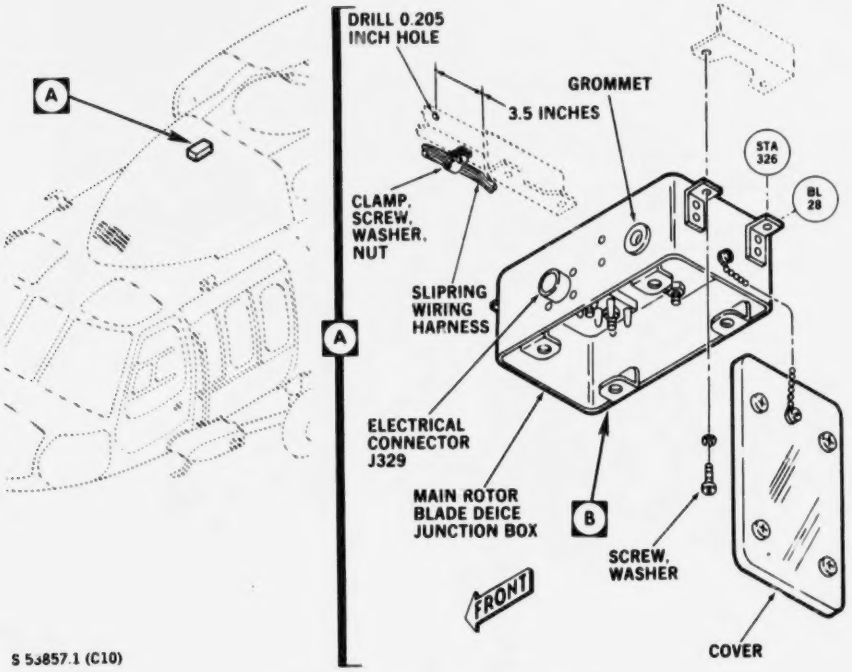

A
DRILL 0.205 INCH HOLE
3.5 INCHES
GROMMET
STA 326
BL 28
CLAMP, SCREW, WASHER, NUT
SLIPRING WIRING HARNESS
A
ELECTRICAL CONNECTOR J329
MAIN ROTOR BLADE DEICE JUNCTION BOX
B
SCREW, WASHER
FRONT
COVER
S 53857.1 (C10)

FIGURE 12-31 (SHEET 1 OF 2)

ct. Secure cover to main rotor blade junction box with fasteners.

cu. Connect wires, No. H6395A20, No. H6395B20N, and No. H6395C20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

cv. Touch up paint ground (PARA 2-5).

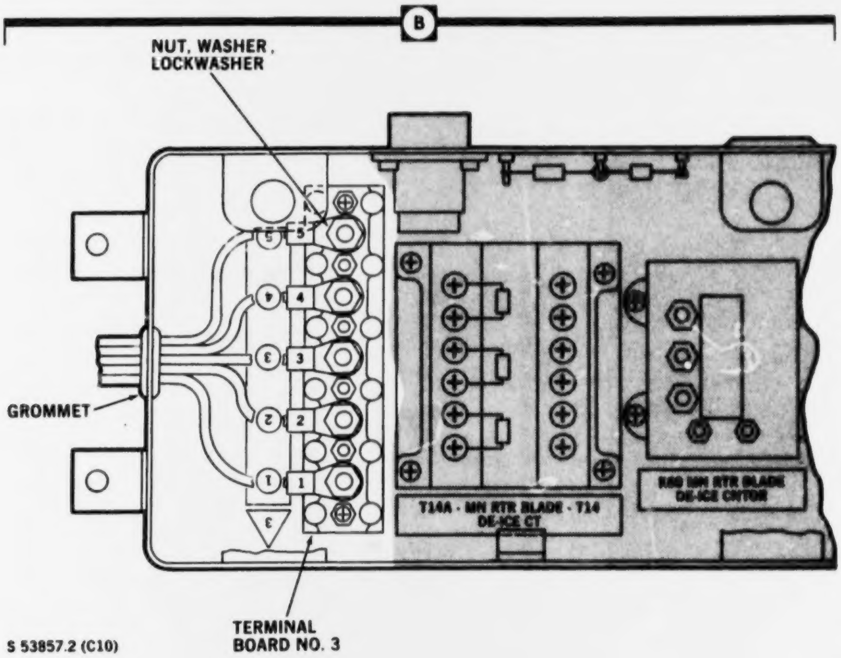

B
NUT, WASHER, LOCKWASHER
GROMMET
1
2
3
4
5
T14A - MN RTR BLADE - T14 DE-ICE CT
K60 MN RTR BLADE DE-ICE CNTOR
TERMINAL BOARD NO. 3
S 53857.2 (C10)

FIGURE 12-31 (SHEET 2 OF 2)

NO. 2 JUNCTION BOX MODIFICATION

cw. Turn off all electrical power.

cx. Unfasten No. 2 junction box cover and hang from chain.

cy. Install holder for current limiters with screws.

cz. Install holder, current limiters, and 50 AMP identification plates.

da. Install current limiters in holder.

db. Remove screws and terminal cover from No. 2 generator contactor, K2.

dc. Remove nuts from No. 2 generator contactor, K2, terminals, A2, B2, and C2.

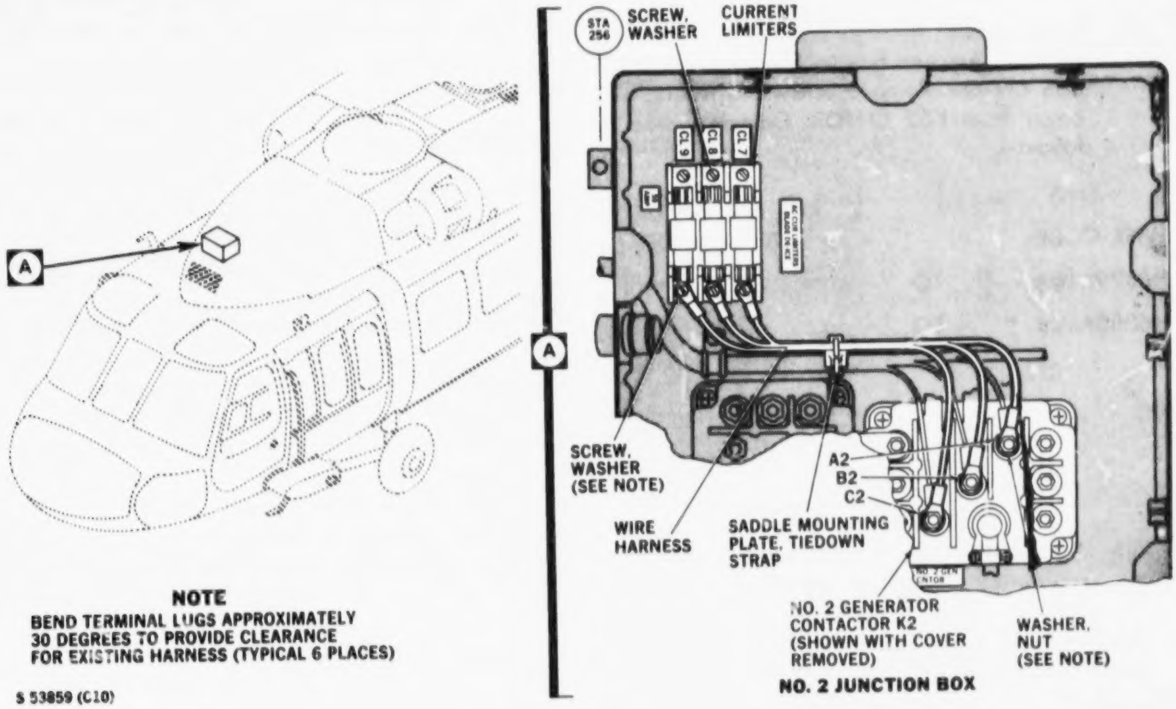
dd. Using screws and washers on current limiters, and nuts and washers on No. 2 generator contactor, K2, terminals, connect wire harness as follows:

TERMINAL	WIRE CODE	TERMINAL
CL7	H644610A	K2-A2
CL8	H644710B	K2-B2
CL9	H644810C	K2-C2

de. Install saddle mounting plate, TC92, and tiedown straps, Item 360, Appendix D, to hold harness.

df. Install terminal cover to No. 2 generator contactor, K2, with screws.

dg. Install No. 2 junction box cover.


A
STA 256
SCREW, WASHER
CURRENT LIMITERS
CL9
CL8
CL7
A
SCREW, WASHER (SEE NOTE)
A2
B2
C2
WIRE HARNESS
SADDLE MOUNTING PLATE, TIEDOWN STRAP
NO. 2 GENERATOR CONTACTOR K2 (SHOWN WITH COVER REMOVED)
WASHER, NUT (SEE NOTE)
NO. 2 JUNCTION BOX

NOTE
BEND TERMINAL LUGS APPROXIMATELY 30 DEGREES TO PROVIDE CLEARANCE FOR EXISTING HARNESS (TYPICAL 6 PLACES)

S 53859 (C10)

FIGURE 12-32

12-6.1 INSTALL 12-6.1

DEICE JUNCTION BOX HARNESS

dh. Feed deice junction box harness from station 343, buttline 19 (right), along same routing as helicopter right main wiring harness to No. 2 junction box (Figure 12-33, Sheet 1).

di. Feed harness through grommet at station 280, buttline 10 (right), to current limiters.

dj. Connect wires to AC CUR LIMITERS BLADE DEICE with screws and washers, as follows:

WIRE CODE		AC CUR LIMITERS BLADE DEICE
H6379A10A	TO	CL7
H6380A10B	TO	CL8
H6381A10C	TO	CL9

dk. Feed harness through small grommet in aux ac deice junction box to K62 MN RTR DEICE BUS CNTOR. Remove screws, washers, and cover from K62 CNTOR. Connect wires as follows:

WIRE CODE		K62 MN RTR DEICE BUS CNTOR
H6379A10A	TO	L1
H6380A10B	TO	L2
H6381A10C	TO	L3

dl. Replace cover on K62 CNTOR with screws and washers.

DEICE JUNCTION BOX FEEDER HARNESS

NOTE

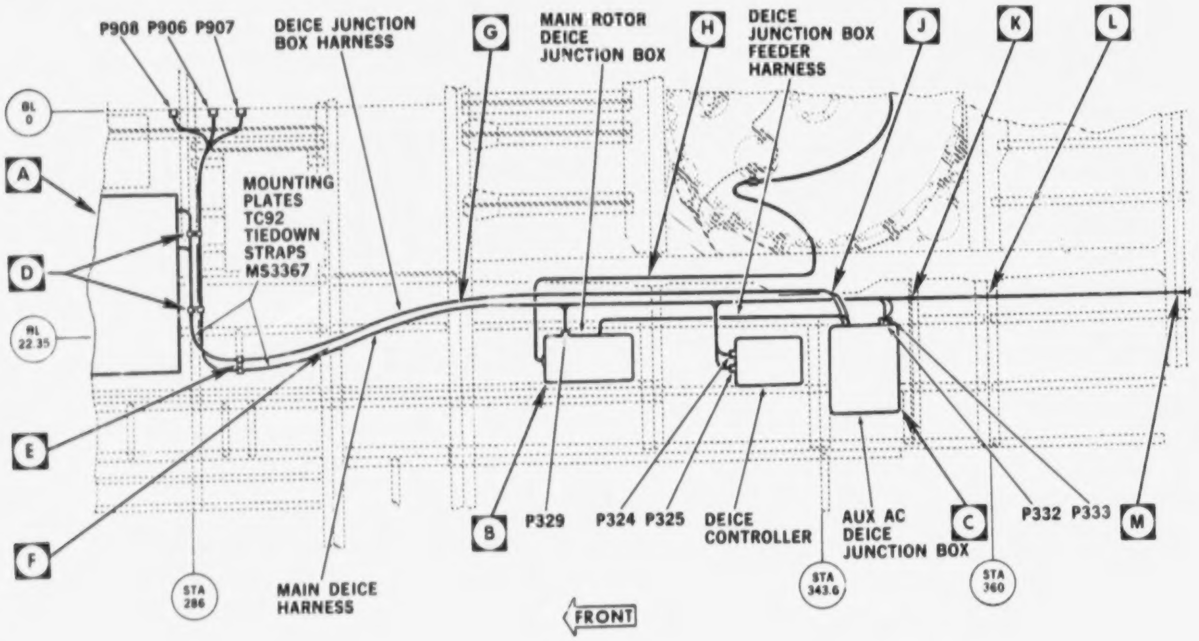
Install junction box feeder harness in aux ac junction box before installing harness in helicopter.

dm. Feed deice junction box feeder harness from aux ac junction box, along same routing as helicopter right main harness to main rotor deice junction box (Figure 12-33, Sheet 1).

dn. Feed harness through grommet in junction box to K60 MN RTR BLADE DEICE CNTOR. Connect wires with nuts and washers as follows:

WIRE CODE		K60 MN RTR DEICE CNTOR
H6431A10A	TO	
H6432A10B	TO	B2
H6433A10C	TO	C2

TORQUE NUTS TO 18 - 20 INCH-POUNDS.


P908 P906 P907
DEICE JUNCTION BOX HARNESS
G
MAIN ROTOR DEICE JUNCTION BOX
H
DEICE JUNCTION BOX FEEDER HARNESS
J
K
L
BL 0
A
MOUNTING PLATES TC92
TIEDOWN STRAPS MS3367
D
BL 22.35
E
F
STA 286
MAIN DEICE HARNESS
B
P329
P324 P325
DEICE CONTROLLER
STA 343.6
AUX AC DEICE JUNCTION BOX
C
STA 360
P332 P333
M
FRONT

S 53858.1 (C10)

CABIN CEILING - RIGHT SIDE LOOKING UP

FIGURE 12-33 (SHEET 1 OF 5)

MAIN DEICE WIRING HARNESS

do. With aid of assistant, feed front end (with plugs, P906, P907, and P908) of main deice wiring harness through bulkheads, from station 360 to bulkhead at station 281, following same routing as APU wiring harness. Feed harness along bulkhead at station 281 to center of helicopter.

dp. Connect electrical connectors, P906, P907, and P908, to electrical connectors, J906, J907, and J908, at stations 283, 286, and 279.

dq. Feed wires through grommet in No. 2 junction box, at station 279, buttline 16.

dr. Route wires along rear of junction box to T3-APU GEN CT. Connect wires as follows:

WIRE CODE		T3-APU GEN CT
X34G20	TO	T1
X35C20	TO	T4
X36G20	TO	T2
X37C20	TO	T5
X38G20	TO	T3
X39C20	TO	T6

ds. Fasten harness to inside rear of box with tiedown straps, Item 360, Appendix D.

dt. Connect electrical connector, P329, to electrical connector, J329, of main rotor blade deice junction box.

du. Connect electrical connector, P324, to electrical connector, J2, and electrical connector, P325, to electrical connector, J1, of deice controller.

12-6.1 INSTALL 12-6.1

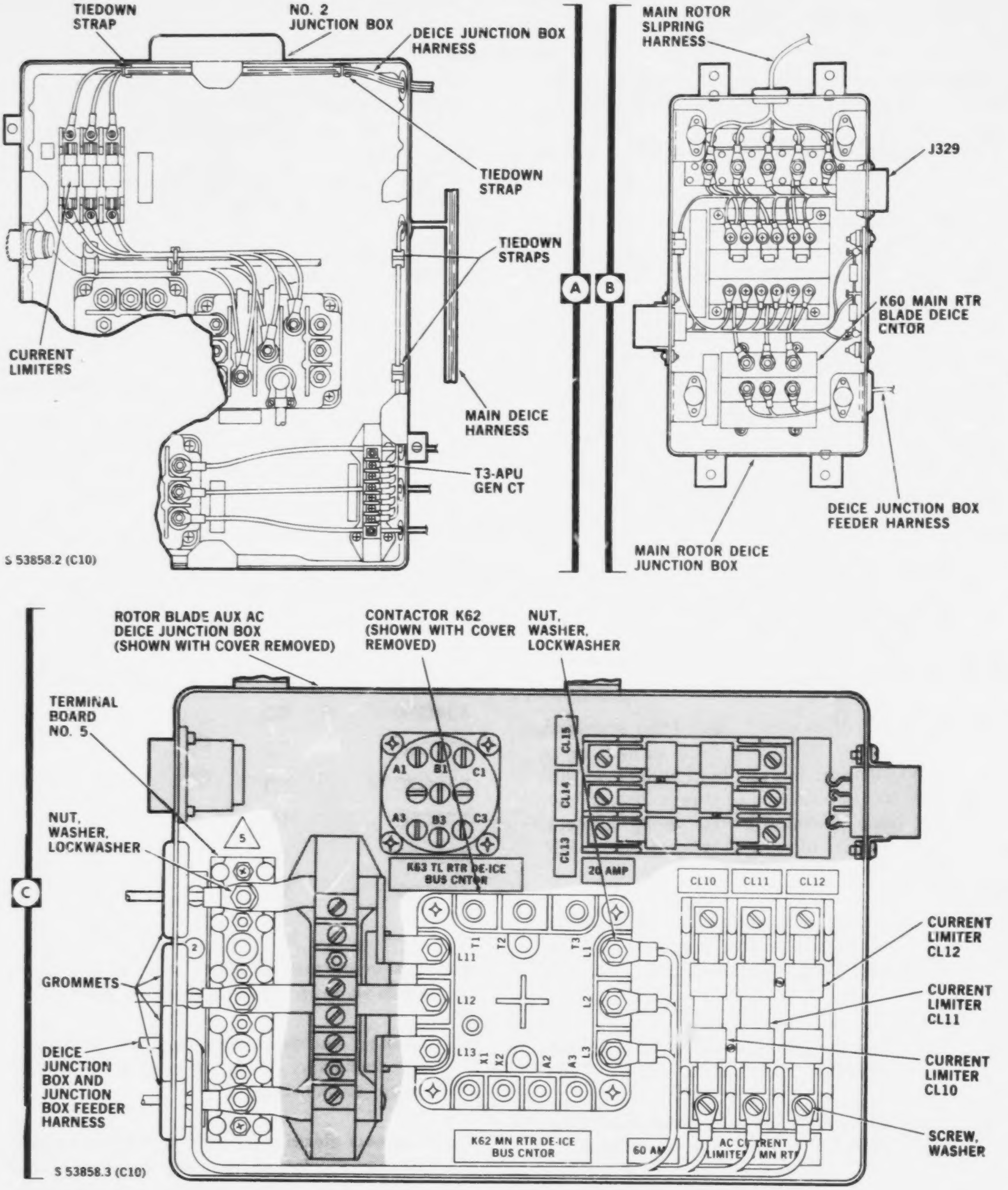

TIEDOWN STRAP
NO. 2 JUNCTION BOX
DEICE JUNCTION BOX HARNESS
TIEDOWN STRAP
TIEDOWN STRAPS
CURRENT LIMITERS
MAIN DEICE HARNESS
T3-APU GEN CT
S 53858.2 (C10)
A
B
MAIN ROTOR SLIPRING HARNESS
J329
K60 MAIN RTR BLADE DEICE CNTOR
DEICE JUNCTION BOX FEEDER HARNESS
MAIN ROTOR DEICE JUNCTION BOX
ROTOR BLADE AUX AC DEICE JUNCTION BOX (SHOWN WITH COVER REMOVED)
CONTACTOR K62 (SHOWN WITH COVER REMOVED)
NUT, WASHER, LOCKWASHER
TERMINAL BOARD NO. 5
NUT, WASHER, LOCKWASHER
C
GROMMETS
DEICE JUNCTION BOX AND JUNCTION BOX FEEDER HARNESS
5
2
A1
B1
C1
A3
B3
C3
K63 TL RTR DE-ICE BUS CNTOR
CL15
CL14
CL13
20 AMP
CL10
CL11
CL12
L11
T1
T2
T3
L1
L12
L2
L13
X1
X2
A2
A3
L3
K62 MN RTR DE-ICE BUS CNTOR
60 AMP
AC CURRENT LIMITER MN RTR
CURRENT LIMITER CL12
CURRENT LIMITER CL11
CURRENT LIMITER CL10
SCREW, WASHER
S 53858.3 (C10)

FIGURE 12-33 (SHEET 2 OF 5)

dv. Connect ground wire to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminal, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

dw. Touch up paint ground (PARA 2-5).

dx. Connect electrical connector, P332, to electrical connector, J332 and electrical connector, P333, to electrical connector, J333, on auxiliary ac deice junction box.

dy. Continue routing harness from station 360, through grommet at station 398, to station 647. Follow routing of helicopter wiring on right side of tail cone.

dz. Let connector hang from pylon. Leave enough slack to connect it to tail pylon harness when harness is installed.

CLAMP DEICE MAIN JUNCTION BOX, AND JUNCTION BOX FEEDER HARNESSES

ea. Clamp harness to tail cone structure at stations 635, 624, and 605 using tiedown straps, Item 360, Appendix D. Clamp harness to tail cone structure at stations 585, 565, 545, 525, and 505 using kit screws. Work from rear to front.

eb. Tie harness to left main harness at station 490 with tiedown straps, Item 360, Appendix D, and mounting plates, TC92.

ec. Clamp harness to transition section structure at stations 479, 467, 464, 455, 433, 425, 421, 409, and 403 using kit screws and spacers. Work from rear to front.

ed. Secure main deice harness to right main harness at station 413 with tiedown straps, Item 360, Appendix D, and mounting plates, TC92.

ee. Secure harness to cabin structure at stations 390, 379, 370, and 360.1 with kit screws, washers, nuts, and clamps. Work from rear to front.

ef. Strap both deice kit harness and infrared countermeasures harness to APU power harness at station 352 with tiedown straps, Item 360, Appendix D, and mounting plates, TC92.

eg. Clamp all harnesses to bulkheads at stations 343, 327, 308, and 295.

eh. Install junction box harness and main deice harness on support at station 286 with screw, washer, nut, clamps, and spacer.

ei. Install junction box harness and main deice harness on bulkhead at station 281, buttlines 12 and 20 with screw, washer, nut, clamps, and spacer.

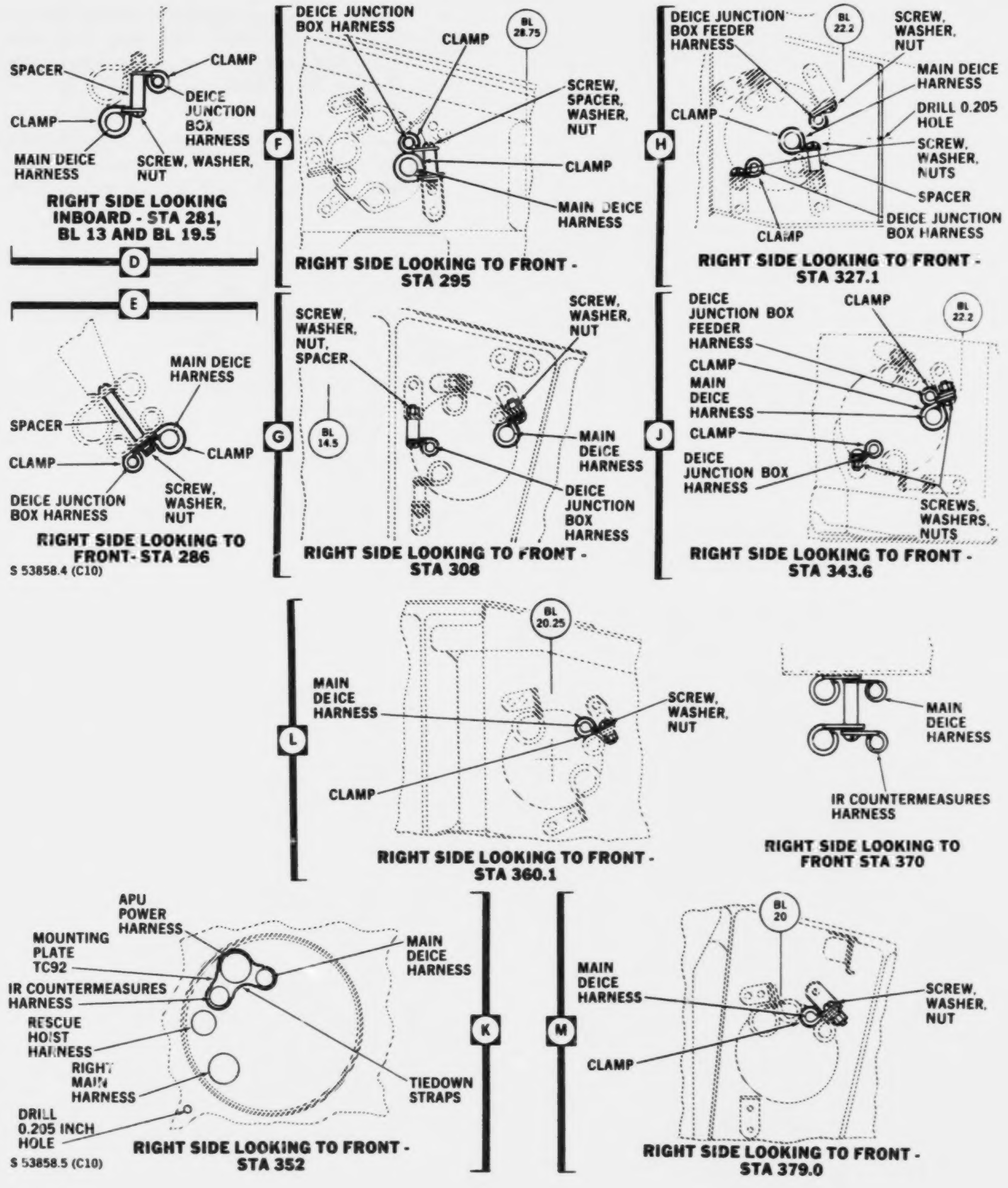

SPACER
CLAMP
CLAMP
DEICE JUNCTION BOX HARNESS
MAIN DEICE HARNESS
SCREW, WASHER, NUT
RIGHT SIDE LOOKING INBOARD - STA 281, BL 13 AND BL 19.5
D
E
MAIN DEICE HARNESS
SPACER
CLAMP
CLAMP
DEICE JUNCTION BOX HARNESS
SCREW, WASHER, NUT
RIGHT SIDE LOOKING TO FRONT- STA 286
S 53858.4 (C10)
F
DEICE JUNCTION BOX HARNESS
CLAMP
BL 28.75
SCREW, SPACER, WASHER, NUT
CLAMP
MAIN DEICE HARNESS
RIGHT SIDE LOOKING TO FRONT - STA 295
G
SCREW, WASHER, NUT, SPACER
BL 14.5
SCREW, WASHER, NUT
MAIN DEICE HARNESS
DEICE JUNCTION BOX HARNESS
RIGHT SIDE LOOKING TO FRONT - STA 308
H
DEICE JUNCTION BOX FEEDER HARNESS
BL 22.2
SCREW, WASHER, NUT
MAIN DEICE HARNESS
DRILL 0.205 HOLE
CLAMP
SCREW, WASHER, NUTS
SPACER
DEICE JUNCTION BOX HARNESS
CLAMP
RIGHT SIDE LOOKING TO FRONT - STA 327.1
J
DEICE JUNCTION BOX FEEDER HARNESS
CLAMP
BL 22.2
CLAMP
MAIN DEICE HARNESS
CLAMP
DEICE JUNCTION BOX HARNESS
SCREWS, WASHERS, NUTS
RIGHT SIDE LOOKING TO FRONT - STA 343.6
L
BL 20.25
MAIN DEICE HARNESS
SCREW, WASHER, NUT
CLAMP
RIGHT SIDE LOOKING TO FRONT - STA 360.1
MAIN DEICE HARNESS
IR COUNTERMEASURES HARNESS
RIGHT SIDE LOOKING TO FRONT STA 370
K
APU POWER HARNESS
MOUNTING PLATE TC92
IR COUNTERMEASURES HARNESS
RESCUE HOIST HARNESS
RIGHT MAIN HARNESS
DRILL 0.205 INCH HOLE
MAIN DEICE HARNESS
TIEDOWN STRAPS
RIGHT SIDE LOOKING TO FRONT - STA 352
S 53858.5 (C10)
M
BL 20
MAIN DEICE HARNESS
SCREW, WASHER, NUT
CLAMP
RIGHT SIDE LOOKING TO FRONT - STA 379.0

FIGURE 12-33 (SHEET 3 OF 5)

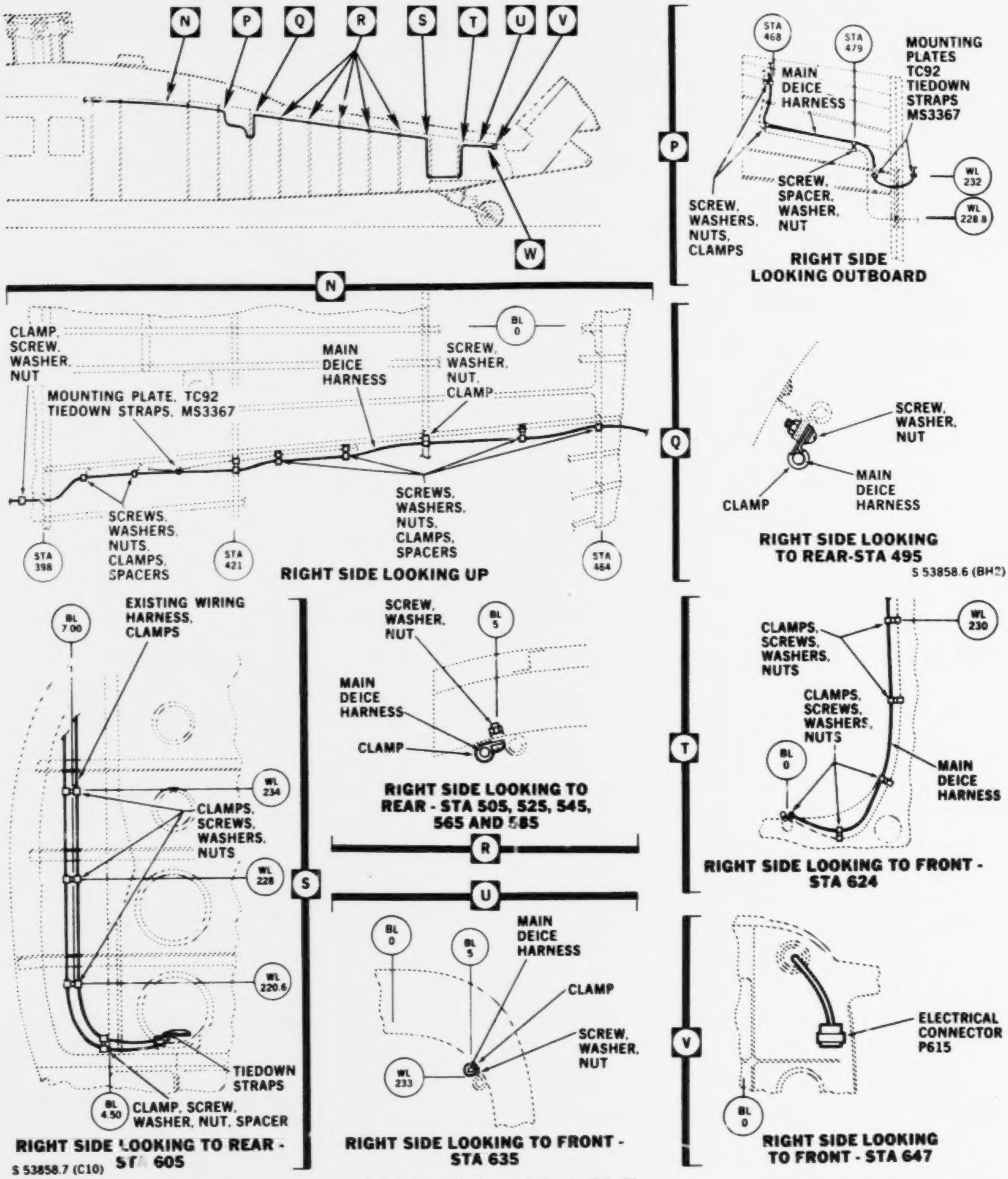

N
P
Q
R
S
T
U
V
W
STA 468
STA 479
MAIN DEICE HARNESS
MOUNTING PLATES TC92 TIEDOWN STRAPS MS3367
WL 232
WL 228.8
SCREW, SPACER, WASHER, NUT
SCREW, WASHERS, NUTS, CLAMPS
RIGHT SIDE LOOKING OUTBOARD
BL 0
CLAMP, SCREW, WASHER, NUT
MAIN DEICE HARNESS
SCREW, WASHER, NUT, CLAMP
MOUNTING PLATE, TC92 TIEDOWN STRAPS, MS3367
SCREWS, WASHERS, NUTS, CLAMPS, SPACERS
SCREWS, WASHERS, NUTS, CLAMPS, SPACERS
STA 398
STA 421
STA 464
RIGHT SIDE LOOKING UP
SCREW, WASHER, NUT
MAIN DEICE HARNESS
CLAMP
RIGHT SIDE LOOKING TO REAR-STA 495
S 53858.6 (BH2)
BL 7.00
EXISTING WIRING HARNESS, CLAMPS
WL 234
CLAMPS, SCREWS, WASHERS, NUTS
WL 228
WL 220.6
TIEDOWN STRAPS
BL 4.50
CLAMP, SCREW, WASHER, NUT, SPACER
RIGHT SIDE LOOKING TO REAR - STA 605
S 53858.7 (C10)
SCREW, WASHER, NUT
BL 5
MAIN DEICE HARNESS
CLAMP
RIGHT SIDE LOOKING TO REAR - STA 505, 525, 545, 565 AND 585
BL 0
BL 5
MAIN DEICE HARNESS
CLAMP
SCREW, WASHER, NUT
WL 233
RIGHT SIDE LOOKING TO FRONT - STA 635
CLAMPS, SCREWS, WASHERS, NUTS
WL 230
CLAMPS, SCREWS, WASHERS, NUTS
BL 0
MAIN DEICE HARNESS
RIGHT SIDE LOOKING TO FRONT - STA 624
ELECTRICAL CONNECTOR P615
BL 0
RIGHT SIDE LOOKING TO FRONT - STA 647

FIGURE 12-33 (SHEET 4 OF 5)

12-6.1 INSTALL

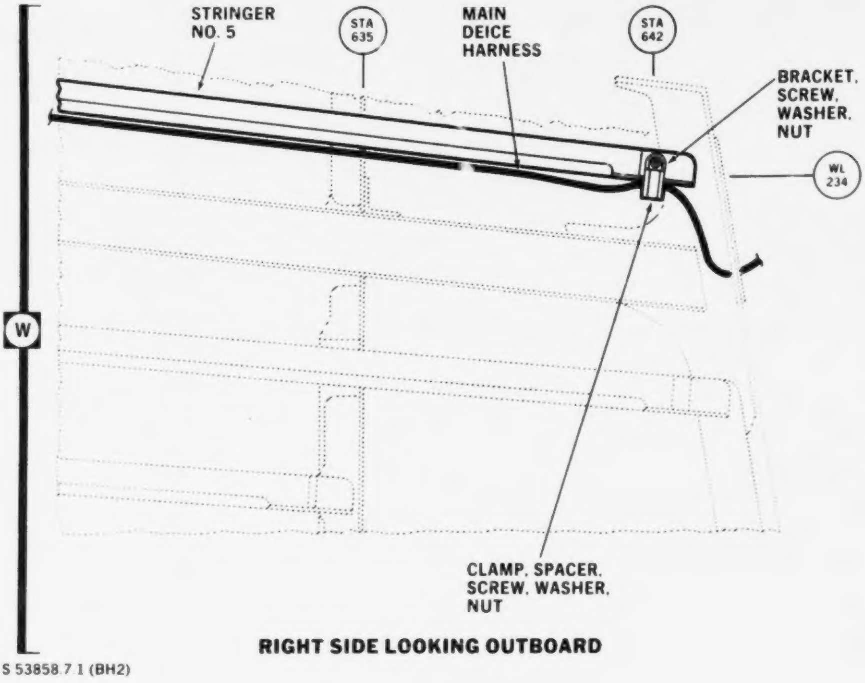

STRINGER NO. 5
STA 635
MAIN DEICE HARNESS
STA 642
BRACKET, SCREW, WASHER, NUT
WL 234
W
CLAMP, SPACER, SCREW, WASHER, NUT
RIGHT SIDE LOOKING OUTBOARD
S 53858.7.1 (BH2)

FIGURE 12-33 (SHEET 5 OF 5)

ICE DETECTOR WIRING HARNESS

ej. Remove screws and cover from right engine air inlet (Figure 12-34).

ek. Remove screws and upper fairing from engine air inlet.

el. Remove dust cap from wiring harness electrical connector, P819.

em. Remove dust cap from electrical connector, J819, on firewall and install on dummy connector.

en. Connect electrical connector, P819, on wiring harness to electrical connector, J819, on airframe firewall.

eo. Clamp harness to firewall with clamp, screw, washer, lockwasher, and nut. Use tooling hole in firewall to mount clamp.

NOTE

If necessary, drill out rivet in tooling hole in air inlet firewall.

ep. Remove clamp on front tube. Turn clamp so tangs are pointing up, and reinstall clamp on tube.

eq. Secure ice detector wiring harness to clamp with clamp, screw, washer, and nut.

ICE DETECTOR HOSE

er. Remove dust cap from rear tube (Figure 12-35).

es. Connect coupling nut on hose end with 90° bend to tube.

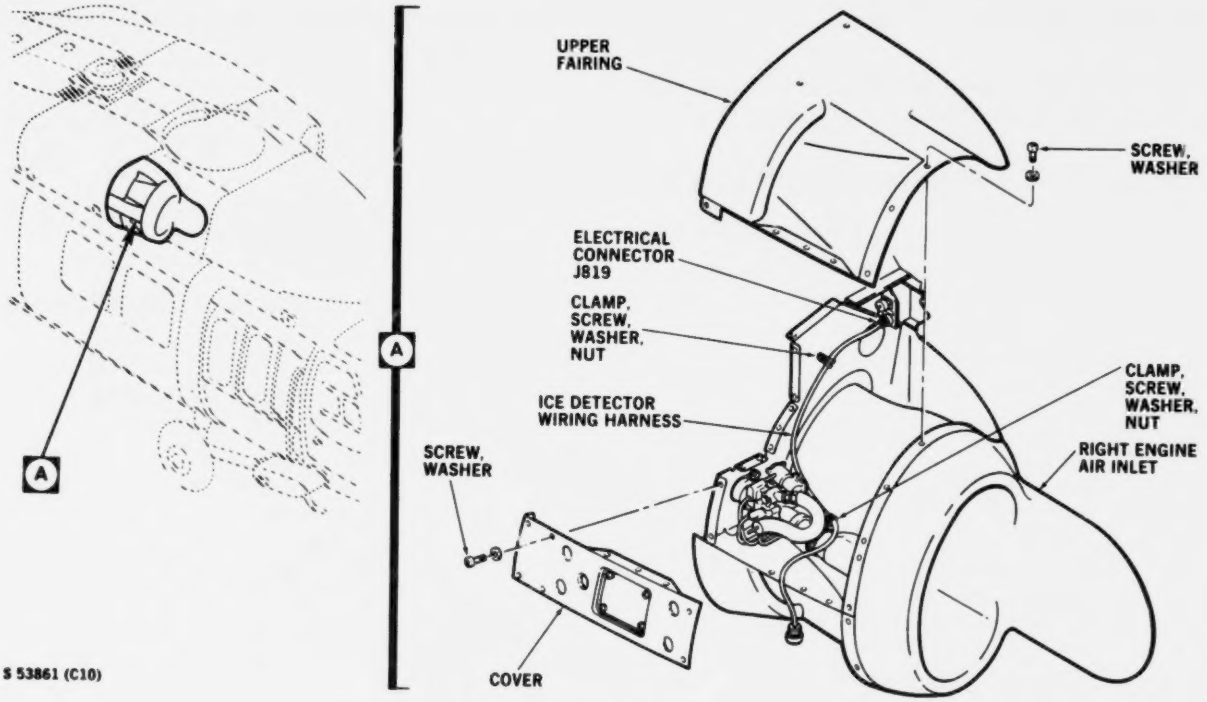

UPPER FAIRING
SCREW, WASHER
ELECTRICAL CONNECTOR J819
CLAMP, SCREW, WASHER, NUT
A
CLAMP, SCREW, WASHER, NUT
ICE DETECTOR WIRING HARNESS
RIGHT ENGINE AIR INLET
SCREW, WASHER
A
COVER
S 53861 (C10)

FIGURE 12-34

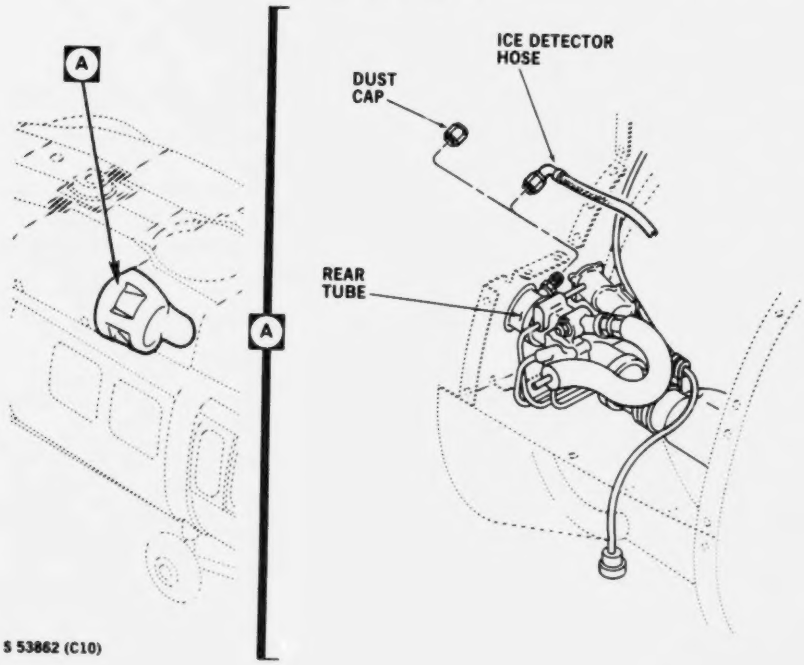

A
ICE DETECTOR HOSE
DUST CAP
REAR TUBE
A
S 53862 (C10)

FIGURE 12-35

12-6.1 INSTALL 12-6.1

ICE DETECTOR

et. Remove screws, washers, and plate from cover (Figure 12-36).

eu. Install ice detector on cover with kit screws and washers.

ev. Connect ice detector wiring harness electrical connector, P326, to electrical connector, J326 on ice detector.

ew. Connect coupling nut on ice detector hose to fitting on ice detector.

ex. Make sure area is free from foreign objects before installing ice detector.

ey. Install upper fairing on engine air inlet with screws and washers.

ez. Install cover on engine air inlet with screws and washers.

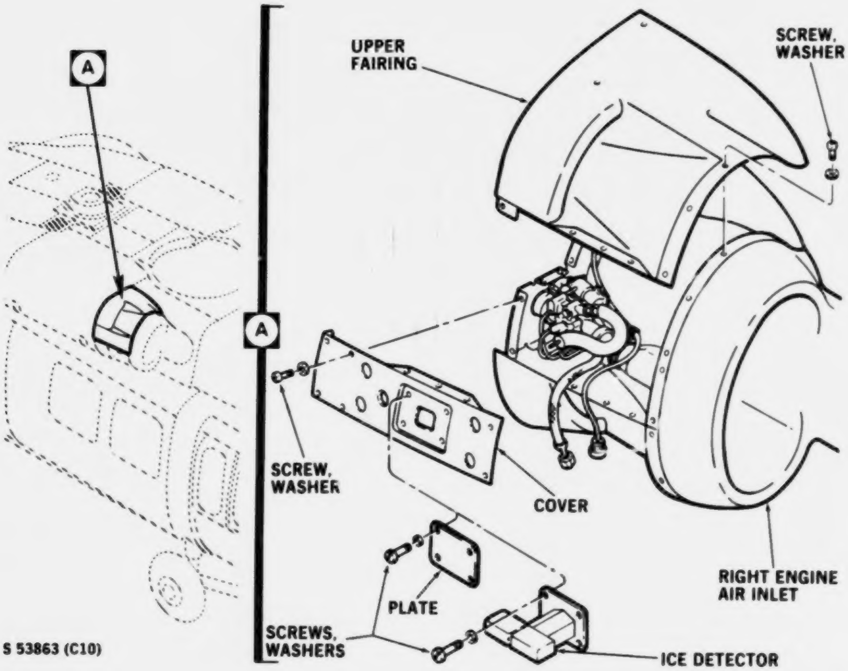

A
UPPER FAIRING
SCREW, WASHER
A
SCREW, WASHER
COVER
RIGHT ENGINE AIR INLET
PLATE
SCREWS, WASHERS
ICE DETECTOR
S 53863 (C10)

FIGURE 12-36

12-6.1 INSTALL 12-6.1

BLADE DEICE OUTSIDE AIR TEMPERATURE (OAT) SENSOR

fa. Turnoff all electrical power.

fb. Open avionics compartment door.

fc. Remove screws, washers, nuts, and triangular dummy cover (Figure 12-37).

fd. Remove sealing compound from helicopter skin by scraping with a nonmetallic scraper. Clean area to be sealed with a clean cloth dampened with degreasing solvent, Item 131, Appendix D. Wipe dry with clean cloth.

fe. Apply a bead of sealing compound, Item 312, Appendix D, to mounting surface of outside air temperature (OAT) sensor to prevent water leakage into avionics compartment.

ff. Place OAT sensor and shield in position and install with screws, washers, and nuts.

fg. Shape sealing compound squeezeout to form an even, concave, continuous seal around mounting plate and skin of helicopter using wooden spatula, Item 386, Appendix D.

fh. Apply sealing compound, Item 312, Appendix D, around screwheads.

fi. Disconnect electrical connector, P122, from dummy connector on intercostal nose section at buttline 10 (right), between stations 187 and 197.

fj. Install dust cover on dummy connector.

fk. Connect electrical connector, P122, to electrical connector, J122, on OAT sensor.

fl. Close avionics compartment door.

TAIL PYLON DEICE HARNESS

fm. Remove screws, washers, nuts, and clamps holding tail pylon harness to pylon at fuselage stations 661.5 and 668, and pylon stations 105, 111.5, 120, 127, 140, 147, 150, 160, 168, 180, 186 and 198 (Figure 12-38). Store hardware for future use.

fn. Install electrical connector, J615, of tail pylon deice harness on bracket at fuselage station 651 with jamnut. Lockwire, Item 203, Appendix D, jamnut of electrical connector, J615, to jamnut of electrical connector, J600.

fo. Clamp deice harness to structure at station 656 with kit screw and clamp.

fp. Clamp deice harness and tail pylon harness to pylon with kit screws, washers, nuts, and clamps at same stations from which pylon harness clamps were removed.

fq. Connect electrical connector, P615, of main deice harness to electrical connector, J615, of tail pylon deice harness.

12-6.1 INSTALL 12-6.1

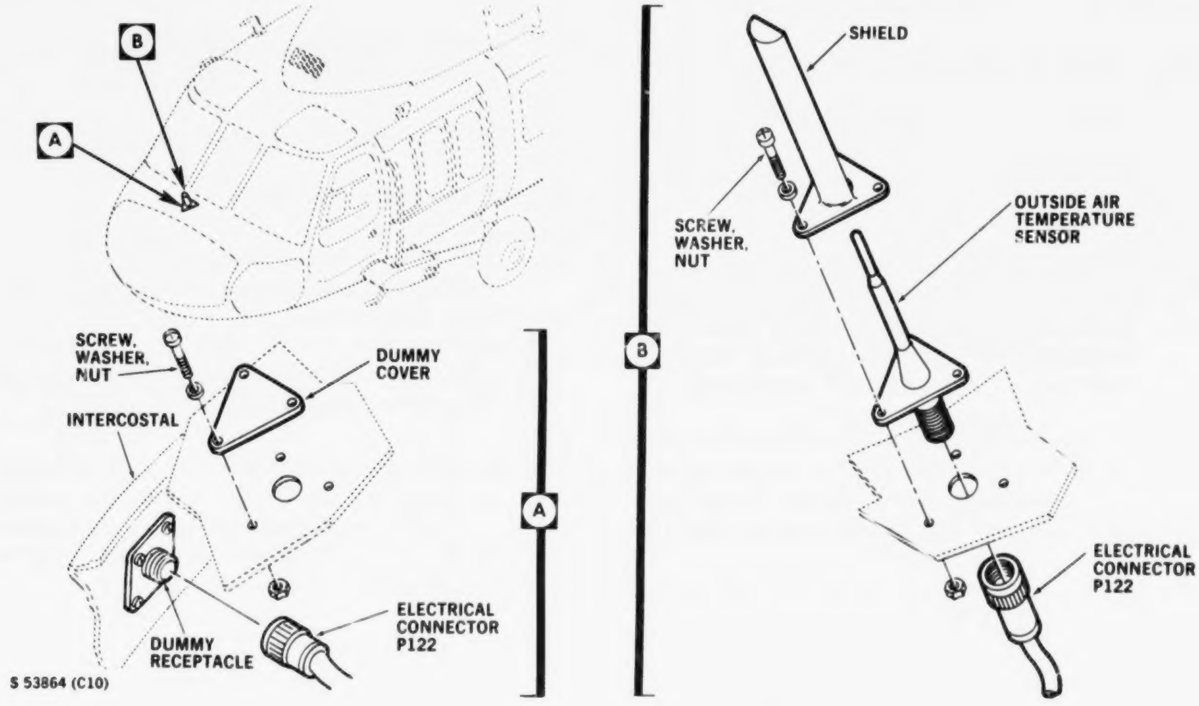
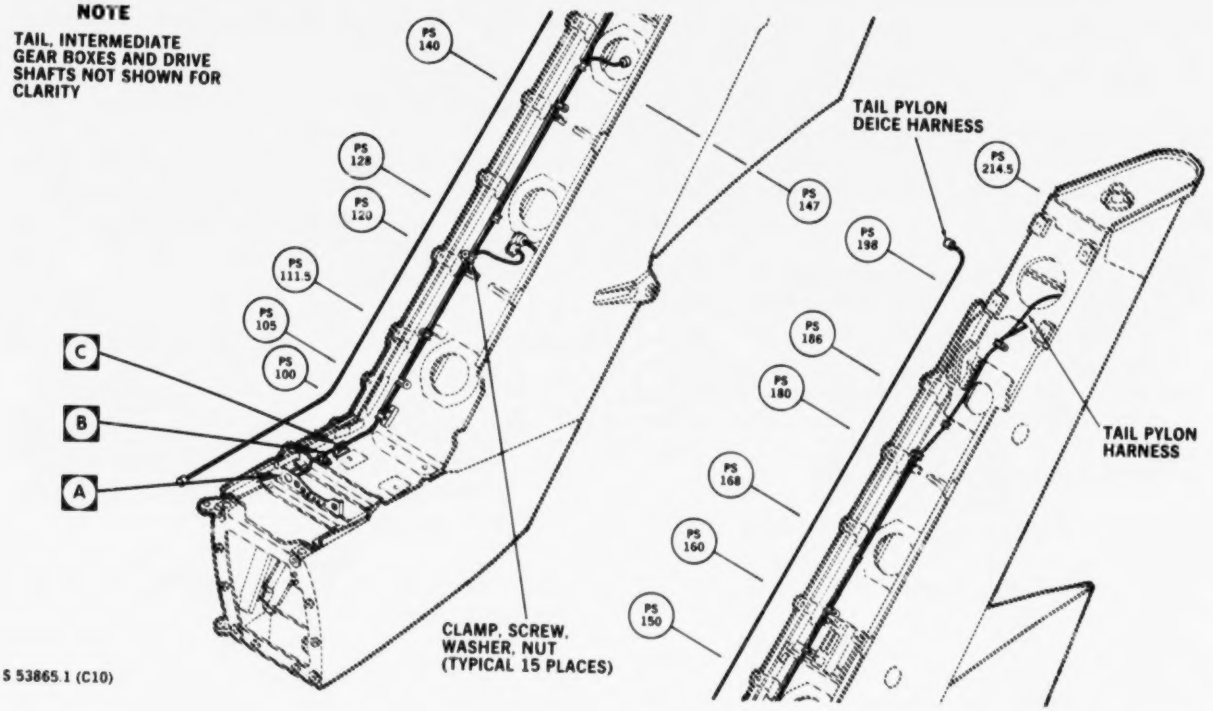

B
A
SCREW, WASHER, NUT
DUMMY COVER
INTERCOSTAL
DUMMY RECEPTACLE
ELECTRICAL CONNECTOR P122
A
B
SHIELD
SCREW, WASHER, NUT
OUTSIDE AIR TEMPERATURE SENSOR
ELECTRICAL CONNECTOR P122
S 53864 (C10)

FIGURE 12-37

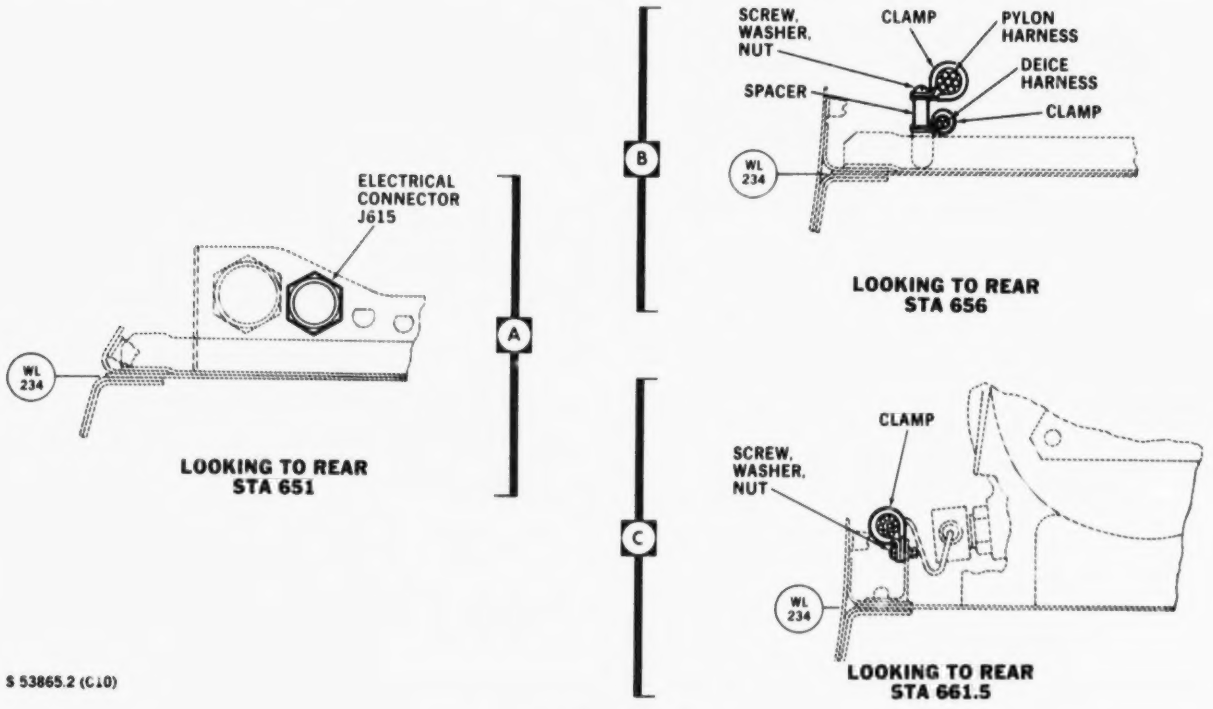
12-6.1 INSTALL 12-6.1

NOTE

TAIL, INTERMEDIATE GEAR BOXES AND DRIVE SHAFTS NOT SHOWN FOR CLARITY


PS 140
PS 128
PS 120
PS 111.5
PS 105
PS 100
C
B
A
PS 147
TAIL PYLON DEICE HARNESS
PS 214.5
PS 198
PS 186
PS 180
PS 168
PS 160
PS 150
TAIL PYLON HARNESS
CLAMP, SCREW, WASHER, NUT (TYPICAL 15 PLACES)

S 53865.1 (C10)


ELECTRICAL CONNECTOR J615
WL 234
A
B
SCREW, WASHER, NUT
CLAMP
PYLON HARNESS
DEICE HARNESS
SPACER
CLAMP
WL 234
C
CLAMP
SCREW, WASHER, NUT
WL 234

LOOKING TO REAR STA 651

LOOKING TO REAR STA 656

LOOKING TO REAR STA 661.5

S 53865.2 (C10)

FIGURE 12-38

TAIL ROTOR SLIPRING

fr. Turn off all electrical power.

fs. Remove inner retention plate (PARA 6-28).

ft. Remove paint from mating areas on tail gear box housing lugs.

fu. Install slipring stator on tail gear box housing with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

fv. Touch up paint on stator boltheads as necessary (PARA 2-5).

fw. Place slipring rotor on stator.

fx. Install inner retention plate (PARA 6-28).

fy. Install tail rotor blades (PARA 5-23).

CAUTION

To prevent damaging slipring attachment lugs, keep bolts from rotating when torquing slipring mounting nuts.

fz. Install kit bolts in retention plate holes marked X. Fasten rotor to retention plates with kit bolts, countersunk washers, washers, spacers, laminated shim washers, and nuts. Install countersunk washers with countersunk side facing bolthead. **PEEL LAMINATED SHIM WASHERS UNTIL THERE IS GAP OF 0.089 - 0.105 INCH BETWEEN SLIPRING ROTOR AND STATOR. TORQUE NUTS TO 428 - 473 INCH-POUNDS.**

ga. Remove and store plug from rear tail rotor gear box.

gb. If necessary, slit grommet, MS35489-9, and wrap around tail pylon deice harness. Slide harness and grommet into slot in rear gear box fairing.

gc. Clamp wire to gear box fairing with clamp, screw, washer, and nut.

gd. Install brush assembly using captive bolts and gaskets, 287526.

ge. Lockwire, Item 198, Appendix D, captive bolts.

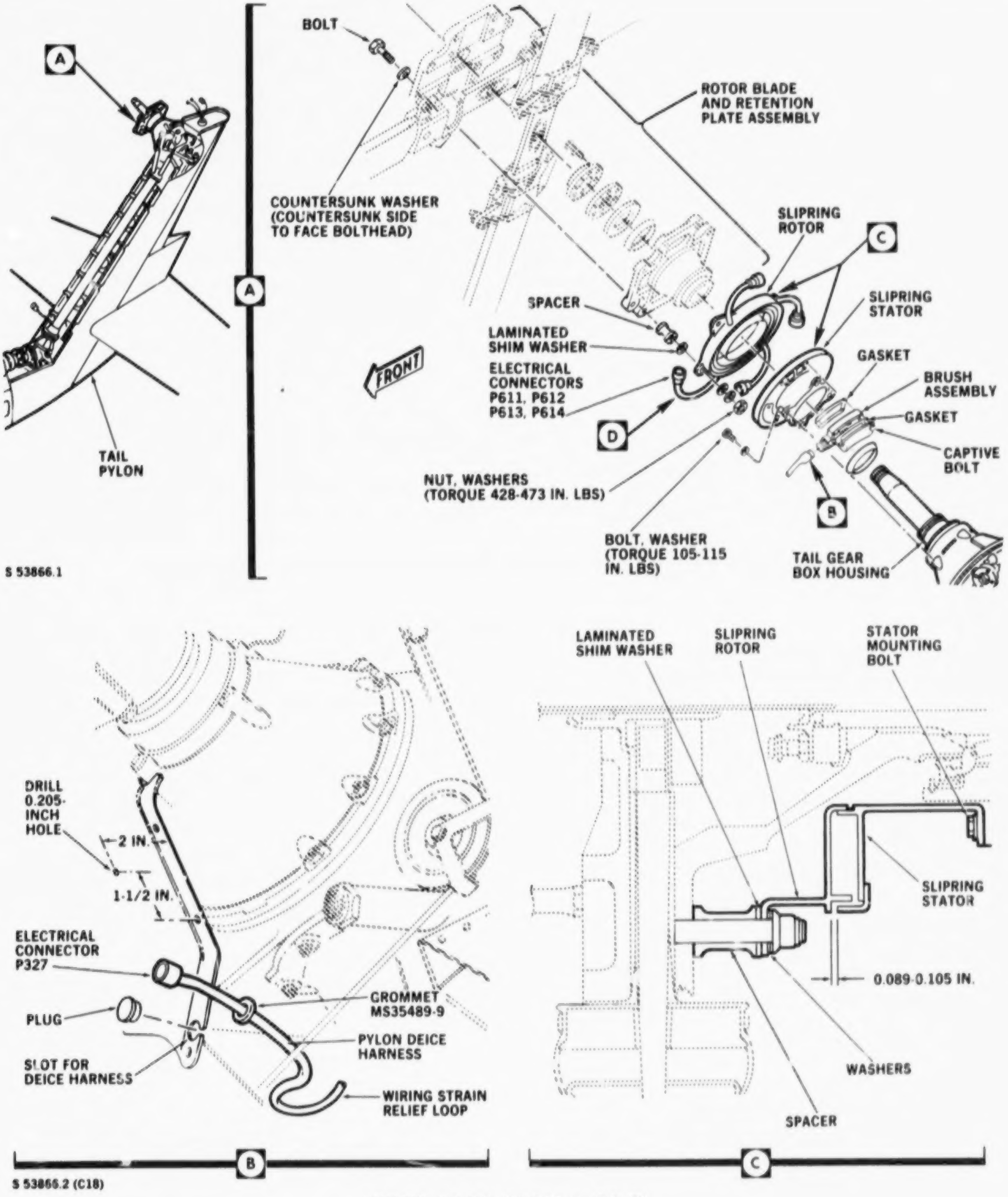

A
TAIL
PYLON
S 53866.1
A
BOLT
COUNTERSUNK WASHER
(COUNTERSUNK SIDE
TO FACE BOLTHEAD)
ROTOR BLADE
AND RETENTION
PLATE ASSEMBLY
SLIPRING
ROTOR
C
SLIPRING
STATOR
SPACER
LAMINATED
SHIM WASHER
FRONT
ELECTRICAL
CONNECTORS
P611, P612
P613, P614
D
GASKET
BRUSH
ASSEMBLY
GASKET
CAPTIVE
BOLT
NUT, WASHERS
(TORQUE 428-473 IN. LBS)
B
BOLT, WASHER
(TORQUE 105-115
IN. LBS)
TAIL GEAR
BOX HOUSING
DRILL
0.205-
INCH
HOLE
2 IN.
1-1/2 IN.
ELECTRICAL
CONNECTOR
P327
PLUG
SLOT FOR
DEICE HARNESS
GROMMET
MS35489-9
PYLON DEICE
HARNESS
WIRING STRAIN
RELIEF LOOP
B
S 53866.2 (C18)
LAMINATED
SHIM WASHER
SLIPRING
ROTOR
STATOR
MOUNTING
BOLT
SLIPRING
STATOR
0.089-0.105 IN.
WASHERS
SPACER
C

FIGURE 12-39 (SHEET 1 OF 2)

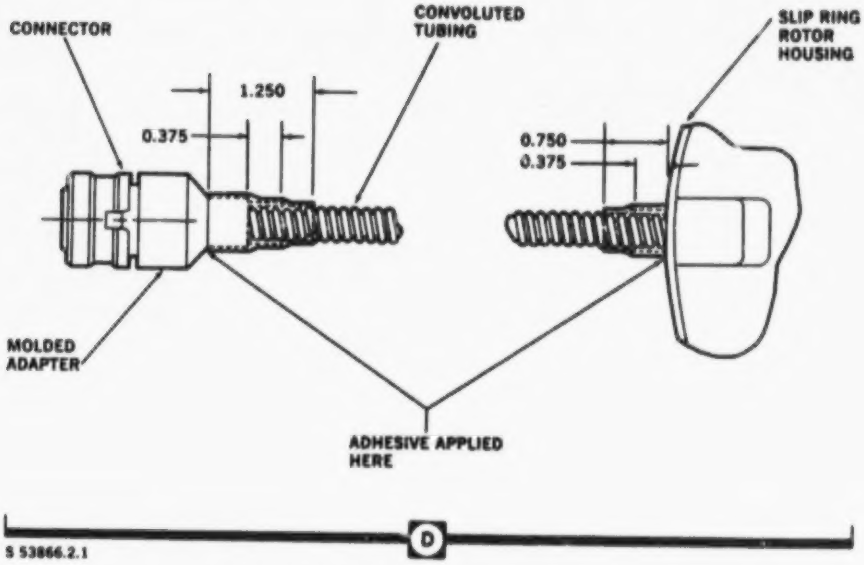

CONNECTOR
CONVOLUTED TUBING
SLIP RING ROTOR HOUSING
1.250
0.375
0.750
0.375
MOLDED ADAPTER
ADHESIVE APPLIED HERE
D
S 53866.2.1

FIGURE 12-39 (SHEET 2 OF 2)

12-6.1 INSTALL 12-6.1

CAUTION

To avoid damage to the electrical harness and electrical connector, P327, form harness into a strain relief loop before connecting electrical connector, P327, to receptacle of slipring brushes.

gf. Connect electrical connector, P327, to slipring brushes receptacle.

gg. Remove and store tail rotor electrical connector caps.

CAUTION

To keep from damaging harness, do not rotate connector housing more than 30° when installing connectors.

NOTE

Rotor blade deice system, modified by MWO 55-1520-237-50-36, requires installation of packing at tail rotor blade connectors and heat-shrinkable sleeving on wiring harness.

gh. Install insulation sleeving, Item 180, Appendix D, on all four tail rotor blade harnesses, as follows:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Clean areas where convoluted tubing meets slipring rotor housing and connector adapter with a clean cloth, dampened with methyl ethyl ketone, Item 233, Appendix D.

(2) Place 3/8-inch piece of insulation sleeving on convoluted tubing snug against slipring rotor housing. Heat-shrink sleeving (TM 55-1500-323-25).

(3) Place 3/4-inch piece of insulation sleeving against housing and apply a little heat at a time. Make sure that insulation sleeving shrinks snugly against housing and tightly around 3/8-inch sleeving and convoluted tubing.

(4) Move sleeving 1/2 inch away from housing by twisting on convoluted tubing (unscrewing).

(5) Apply adhesive, Item 31, Appendix D, to two threads of convoluted tubing and a 1/8-inch wide bead where tubing meets housing.

(6) Screw sleeving back against housing.

(7) Place 3/8-inch piece of sleeving against connector adapter (Figure 12-39, Sheet 2, Detail D). Heat shrink sleeving (TM 55-1500-323-25).

(8) Place 1-1/4-inch piece of sleeving against tapered part of adapter and shrink to snug fit.

(9) Apply bead of adhesive, Item 31, Appendix D, where tubing meets adapter.

(10) Allow adhesive to cure for 24 hours at 60° - 70°F (16° - 21°C) or for 2 hours at 120°F (49°C).

gi. Connect tail rotor slipring electrical connectors, P611, P612, P613, and P614, to tail rotor electrical connectors, using packing, MS9068-018.

gj. Store these parts for reuse (TM 38-230-1):

(1) Bifilar cover bolts.

(2) Bifilar cover.

(3) Main rotor shaft access cover.

(4) Main rotor blade electrical connector caps.

(5) Countersunk washers from spindle bearing end plate.

(6) Droop stop cams.

(7) Droop stop springs.

(8) Screws from droop stop spring pin clip.

(9) Screws from bulkheads at station 327.

(10) Tail rotor electrical connector caps.

(11) Rear tail rotor fairing plug.

(12) Screws, washers, nuts, and clamps for tail pylon harness.

(13) Screws, washers, and nuts removed when installing main deice harness, deice junction box harness, and deice junction box feeder harness.

(14) Dummy cover for OAT sensor.

(15) Plate from right engine air inlet cover.

(16) Dust cap from tube assembly on right engine air inlet.

(17) Dummy plates for blade deice test panel, control panel, and ice rate indicator panel.

INSTALL PANELS

gk. Do initial installation operational check of blade deicing system (TM 55-1520-237-T).

gl. Check for foreign objects before closing up.

gm. Install tail gear box cover, 5T-6T-12, on tail pylon. Fasten fasteners.

gn. Hinge tail pylon drive shaft cover, 5T-6T-11, closed. Fasten fasteners.

go. Install access panels, 5T-5B-18, and 6T-6B-32, on rear tail cone with screws and washers.

gp. Install intermediate gear box cover, 5T-6T-17, on tail cone. Fasten fasteners.

gq. Install cargo netting on right rear stowage compartment.

gr. Install soundproofing on right side stowage compartment (PARA 2-32).

gs. Install soundproofing on right side cabin ceiling, from stations 247 to 398, buttline 0 to right edge of cabin (PARA 2-32).

gt. Install main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

gu. Install both troop seat support tubes (PARA 2-23).

gv. Install troop seats in cabin (PARA 2-23).

gw. Balance main and tail rotors (PARA 5-18 and PARA 5-26).

12-6.2 REMOVE 12-6.2

PREPARE HELICOPTER FOR REMOVAL

CAUTION

To keep covers and fairings from being damaged by wind, make sure they are secured when hinged open.

a. Turn off all electrical power.

b. Remove troop seats from cabin (PARA 2-23).

c. Remove soundproofing from right cabin ceiling, between stations 247 and 398, buttline 0, and right edge of cabin (PARA 2-32).

d. Remove main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

e. Remove soundproofing from right stowage compartment (PARA 2-32).

f. Remove cargo netting from right side rear stowage compartment.

g. Release fasteners on intermediate gear box cover, 5T-6T-17, and remove cover from helicopter (PARA 2-56).

h. Remove screws, washers, and access panels, 5T-5B-18 and 6T-6B-32.

i. Release fasteners and hinge open pylon drive shaft cover, 5T-6T-11.

j. Release fasteners, and remove front tail gear box cover, 5T-6T-12.

k. Engage gust lock.

TAIL ROTOR SLIPRING

l. Disconnect tail rotor slipring electrical connectors from tail rotor blade electrical connectors. Remove and discard packing (Figure 12-40).

CAUTION

While tightening or loosening slipring attachment nuts, the mating bolts shall be held so as not to turn and transmit a load to the slipring lugs.

m. Remove bolts, spacers, and shims holding rotor to retention plate.

n. Remove tail rotor blades (PARA 5-23).

o. Disconnect electrical connector from tail rotor brushes.

p. Remove harness and grommet from slot in rear gear box fairing.

q. Install plug in slot in rear gear box fairing.

r. Remove inner retention plate (PARA 6-28).

s. Remove slipring rotor.

t. Remove bolts and washers holding slipring stator to output housing on tail gear box. Remove stator and brushes.

u. Touch up lug area with primer, Item 274, Appendix D. Let primer dry and touch up area with coating, Item 148, Appendix D.

v. Install inner retention plate (PARA 6-28).

w. Install tail rotor assembly (PARA 5-23).

x. Install caps on tail rotor blade electrical connectors. Lockwire, Item 199, Appendix D, caps to screwheads.

12-6.2 REMOVE 12-6.2

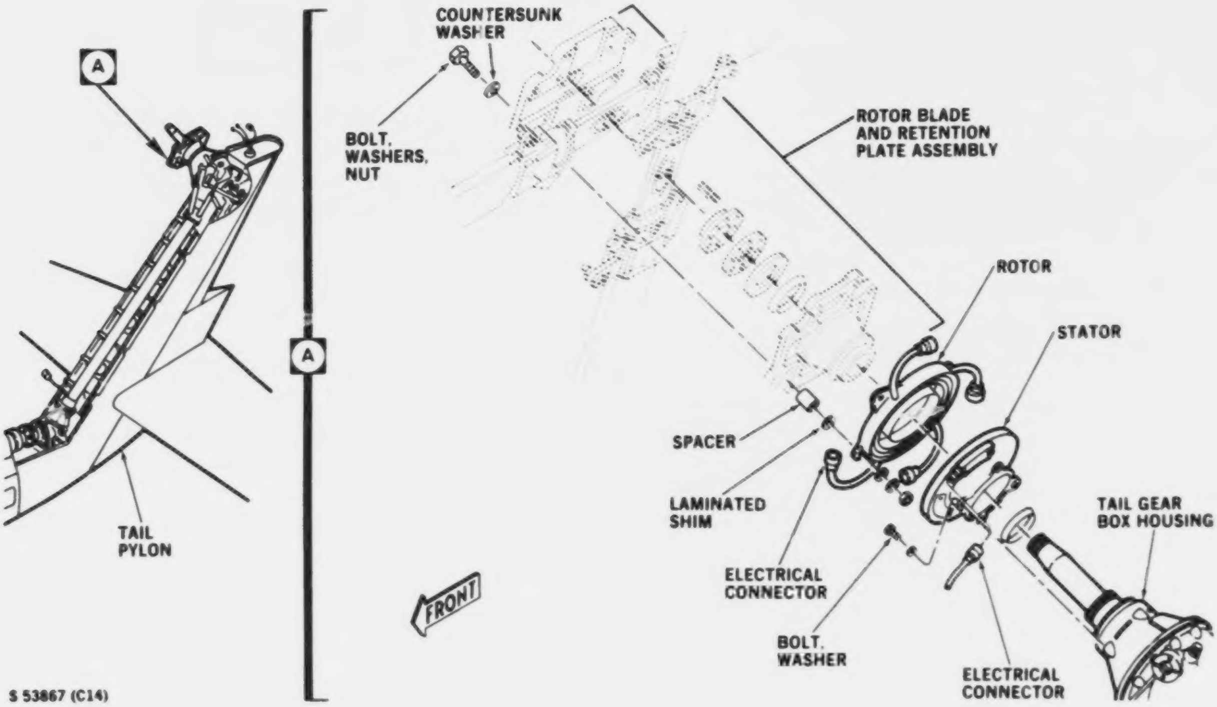

A
TAIL PYLON
COUNTERSUNK WASHER
BOLT, WASHERS, NUT
ROTOR BLADE AND RETENTION PLATE ASSEMBLY
ROTOR
STATOR
SPACER
LAMINATED SHIM
ELECTRICAL CONNECTOR
BOLT, WASHER
ELECTRICAL CONNECTOR
TAIL GEAR BOX HOUSING
FRONT
S 53867 (C14)

FIGURE 12-40

TAIL PYLON DEICE HARNESS

y. Remove screws, washers, nuts, and clamps holding deice harness and tail pylon harness to pylon at fuselage stations 661.5, and 668, and pylon stations 105, 111.5, 120, 127, 140, 147, 150, 160, 168, 180, 186, and 198. Store all hardware with deice kit (Figure 12-41).

z. Remove clamp holding deice harness to pylon at fuselage station 656.

aa. Disconnect electrical connector, P615, from electrical connector, J615.

ab. Remove jamnut, and electrical connector, J615, of tail pylon deice harness from bracket at fuselage station 651.

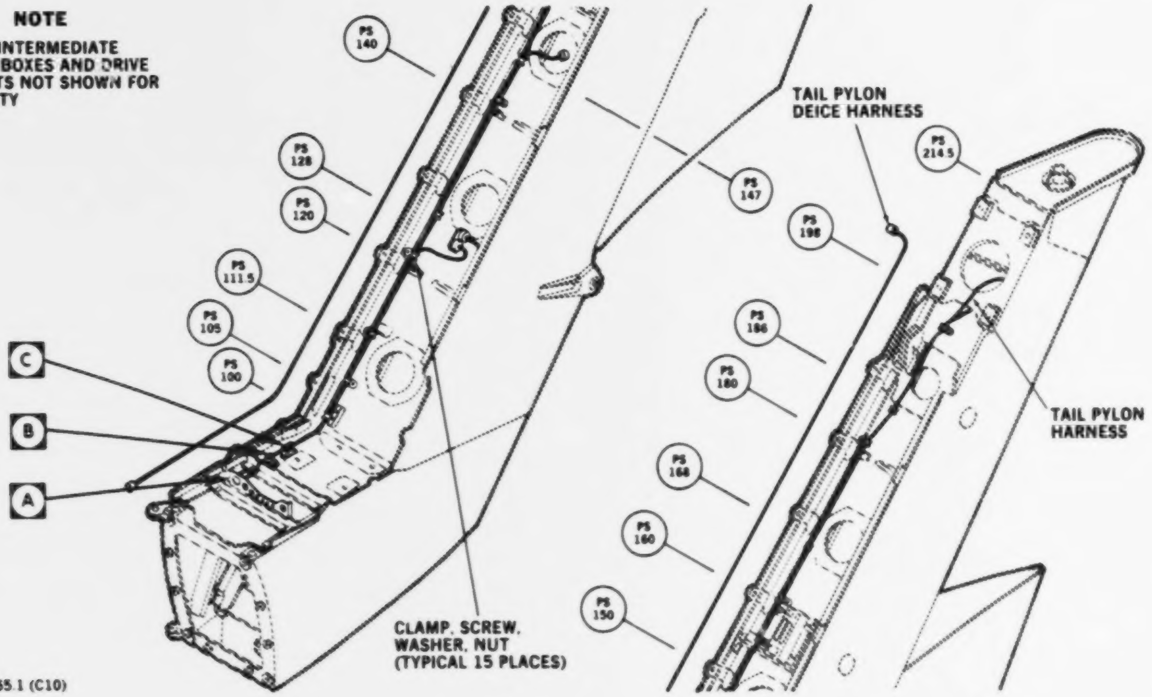
ac. Remove tail rotor pylon harness from helicopter.

ad. Clamp tail pylon harness to tail pylon with screws, washers, nuts, and clamps at fuselage stations 105, 111.5, 120, 127, 140, 147, 150, 160, 168, 180, 186, and 198.

12-6.2 REMOVE 12-6.2

NOTE

TAIL, INTERMEDIATE GEAR BOXES AND DRIVE SHAFTS NOT SHOWN FOR CLARITY


PS 140
PS 128
PS 120
PS 111.5
PS 105
PS 100
C
B
A
PS 147
TAIL PYLON DEICE HARNESS
PS 214.5
PS 198
PS 186
PS 180
PS 168
PS 160
PS 150
TAIL PYLON HARNESS
CLAMP, SCREW, WASHER, NUT (TYPICAL 15 PLACES)

S 53865.1 (C10)

FIGURE 12-41 (SHEET 1 OF 2)

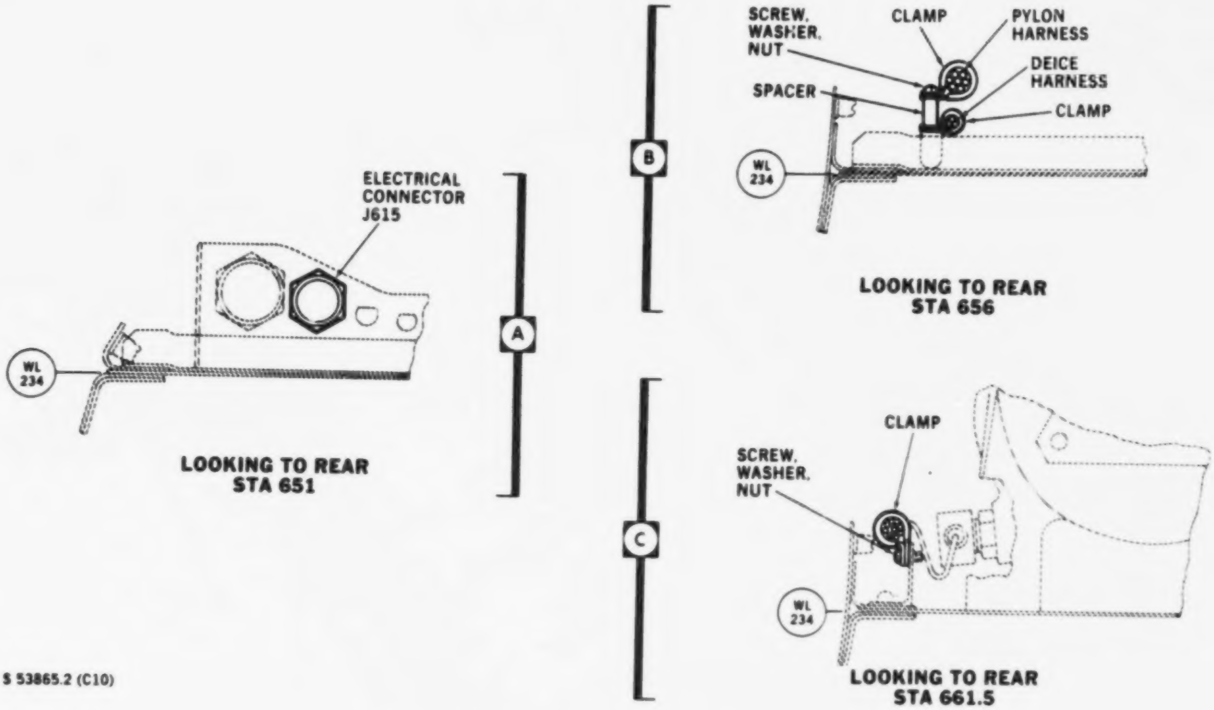

SCREW,
WASHER,
NUT
CLAMP
PYLON
HARNESS
DEICE
HARNESS
SPACER
CLAMP
B
WL
234
LOOKING TO REAR
STA 656
ELECTRICAL
CONNECTOR
J615
A
WL
234
LOOKING TO REAR
STA 651
CLAMP
SCREW,
WASHER,
NUT
C
WL
234
LOOKING TO REAR
STA 661.5
S 53865.2 (C10)

FIGURE 12-41 (SHEET 2 OF 2)

12-6.2 REMOVE

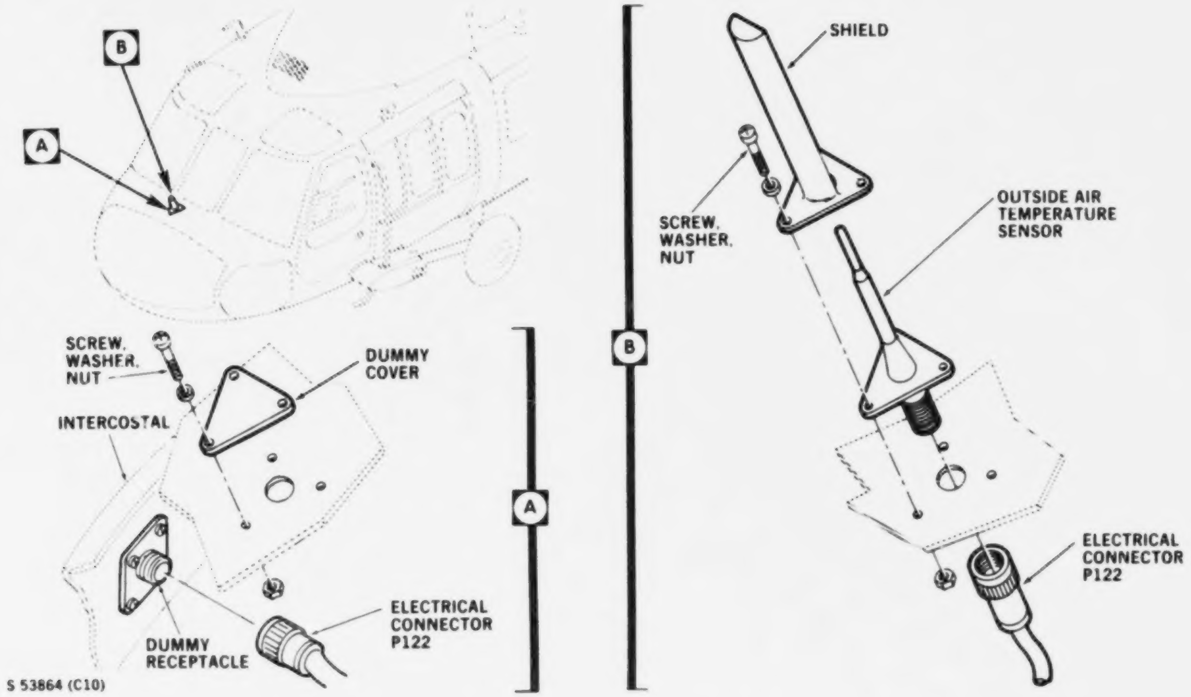

B
A
SCREW, WASHER, NUT
DUMMY COVER
INTERCOSTAL
DUMMY RECEPTACLE
ELECTRICAL CONNECTOR P122
A
B
SHIELD
SCREW, WASHER, NUT
OUTSIDE AIR TEMPERATURE SENSOR
ELECTRICAL CONNECTOR P122
S 53864 (C10)

FIGURE 12-42

BLADE DEICE OUTSIDE AIR TEMPERATURE (OAT) SENSOR

ae. Turn off all electrical power.

af. Open avionics compartment door.

ag. Disconnect electrical connector, P122, from electrical connector, J122, on sensor.

ah. Remove dust cover on dummy connector, on intercostal nose section at buttline 10 (right), between stations 187 and 197.

ai. Connect electrical connector, P122, to dummy receptacle.

aj. Remove screws, washers, nuts, outside air temperature (OAT) sensor, and shield.

ak. Remove sealing compound from OAT sensor shield and helicopter skin by scraping with a nonmetallic scraper. Clean area to be sealed with a clean cloth dampened with degreasing solvent, Item 131, Appendix D.

al. Apply sealing compound, Item 312, Appendix D, around screwheads.

am. Apply a bead of sealing compound, Item 312, Appendix D, to mounting surface of dummy cover, to prevent water leakage into avionics compartment.

an. Install triangular dummy cover with screws, washers, and nuts.

ao. Shape sealing compound squeezeout to form an even, concave, continuous seal around cover and skin using wooden spatula, Item 386, Appendix D.

ap. Close avionics compartment door.

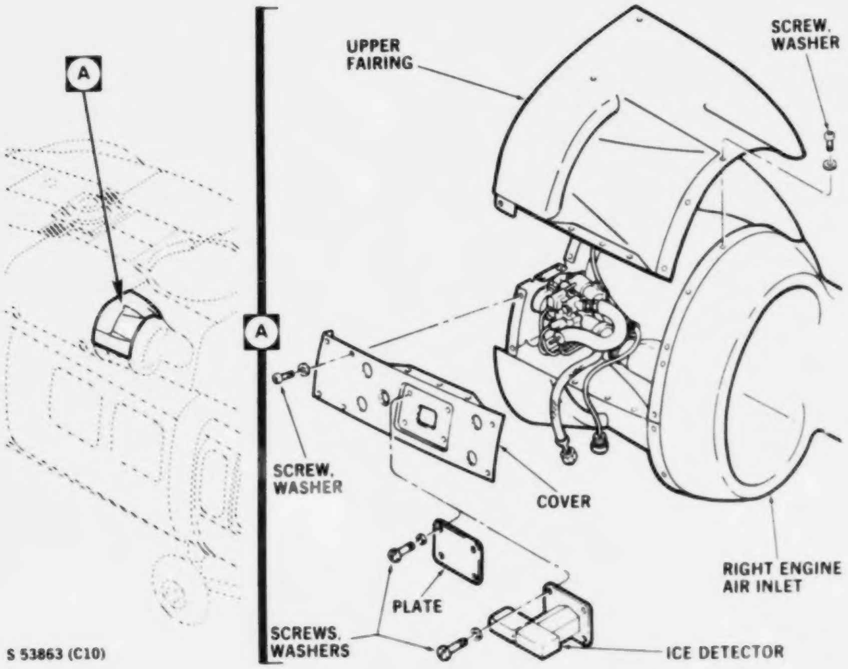

A
UPPER FAIRING
SCREW, WASHER
A
SCREW, WASHER
COVER
RIGHT ENGINE AIR INLET
PLATE
SCREWS, WASHERS
ICE DETECTOR
S 53863 (C10)

FIGURE 12-43

ICE DETECTOR

aq. Remove screws and cover from right engine air inlet (Figure 12-43).

ar. Disconnect coupling nut on hose from hose fitting on ice detector.

as. Disconnect electrical connector, P326, from ice detector.

at. Remove screws and ice detector from cover.

au. Install plate on cover with screws and washers.

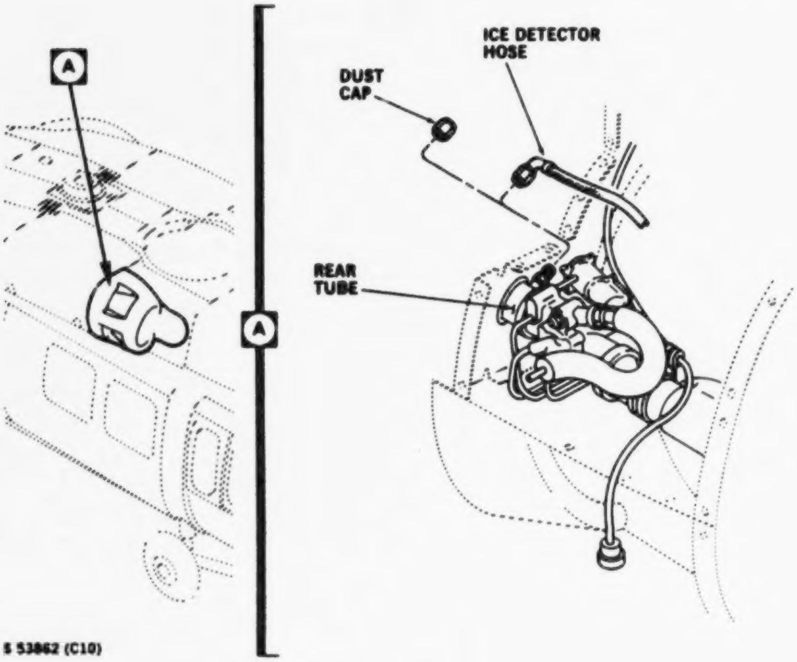

A
A
ICE DETECTOR HOSE
DUST CAP
REAR TUBE
S 53862 (C10)

FIGURE 12-44

ICE DETECTOR HOSE

av. Remove screws, washers, and upper fairing (Figure 12-44).

aw. Disconnect coupling nut on hose, and remove hose from rear tube.

ax. Install dust cap on tube.

12-6.2 REMOVE 12-6.2

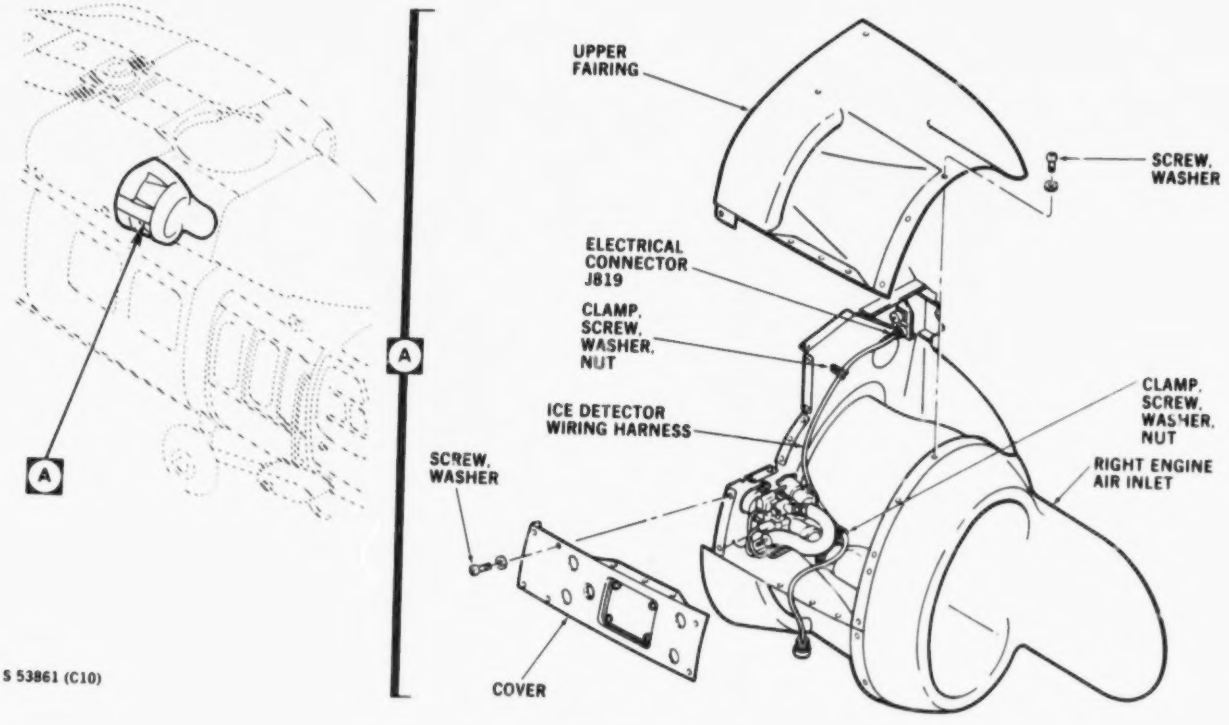

UPPER FAIRING
SCREW, WASHER
ELECTRICAL CONNECTOR J819
CLAMP, SCREW, WASHER, NUT
ICE DETECTOR WIRING HARNESS
CLAMP, SCREW, WASHER, NUT
RIGHT ENGINE AIR INLET
SCREW, WASHER
COVER
A
A
S 53861 (C10)

FIGURE 12-45

ICE DETECTOR WIRING HARNESS

ay. Remove screw, washer, and clamp holding harness to right firewall (Figure 12-45).

az. Disconnect electrical connector, P819, from electrical connector, J819, on firewall.

ba. Remove dust cover from dummy connector, and install on electrical connector, J819.

bb. Unclamp ice detector wiring harness from tube. Reclamp engine air inlet harness on tube with screw, washer, and nut.

bc. Install upper fairing with screws and washers.

bd. Install cover on air inlet with screws and washers.

UNCLAMP MAIN, JUNCTION BOX, AND JUNCTION BOX FEEDER HARNESSES

be. Working from front to rear, remove screws, washers, nuts, clamps, and spacers holding deice main, junction box, and junction box feeder harnesses to bulkheads at stations 281, 295, 308, 327, 343, 360, 370, 390, and 399 (Figure 12-46, Sheet 1). Store kit hardware for future use.

bf. Cut tiedown straps at stations 352 and 413, and remove mounting plates, TC92. Store mounting plates for future use.

bg. Unclamp main deice harness from transition section at stations 403, 409, 421, 425, 433, 455, 464, 467, and 479. Store kit hardware for future use.

bh. Cut tiedown straps at station 490. Store mounting plates for future use.

bi. Unclamp main deice harness on right side of tail cone at stations 505, 525, 545, 565, 585, 605, 624, and 635. Store kit hardware for future use.

bj. Remove tiedown straps from harness at station 605.

REMOVE DEICE WIRING HARNESSES

bk. Remove main deice wiring harness from pylon from rear to front through bulkhead at station 360. Have assistant help feed harness through holes in bulkheads.

bl. Disconnect electrical connector, P332, from electrical connector, J332, and electrical connector, P333, from electrical connector, J333, on aux ac junction box.

bm. Disconnect electrical connector, P324, from electrical connector, J2, and electrical connector, P325, from electrical connector, J1, of deice controller.

bn. Disconnect electrical connector, P329, from electrical connector, electrical connector, J329, of main rotor blade deice junction box.

bo. Disconnect main deice harness from T3-APU GEN CT in No. 2 junction box. Cut tiedown straps holding harness, and remove harness from junction box.

bp. Disconnect electrical connector, P906, from electrical connector, J906, electrical connector, P907, from electrical connector, J907, and electrical connector, P908, from electrical connector, J908.

bq. With aid of assistant, feed main deice harness out of helicopter, from front to rear, through bulkhead at station 352.

br. In No. 2 junction box, remove deice junction box harness from AC CURRENT LIMITERS BLADE DEICE. Cut tiedown straps holding harness to junction box, and remove harness from junction box.

bs. In aux ac deice junction box, remove screws, washers, and cover from K62 MN RTR DEICE BUS CNTOR. Remove wires from terminals L1, L2, and L3. Remove wires from junction box through grommet.

bt. With aid of assistant, feed deice junction box harness out of helicopter from front to rear through hole in bulkhead at station 343.

bu. In aux ac deice junction box, remove deice junction box feeder harness from AC CURRENT LIMITERS MN RTR. Remove wires from junction box through grommet.

bv. In deice junction box, remove junction box feeder harness from terminals A2, B2, and C2 of K60 MN RTR DEICE CNTOR.

bw. With aid of assistant, feed junction box feeder harness out of helicopter from front to rear, through hole in bulkhead at station 343.

bx. Reinstall right main wiring harness at station 281, buttlines 12 and 20, with screws, washers, and nuts.

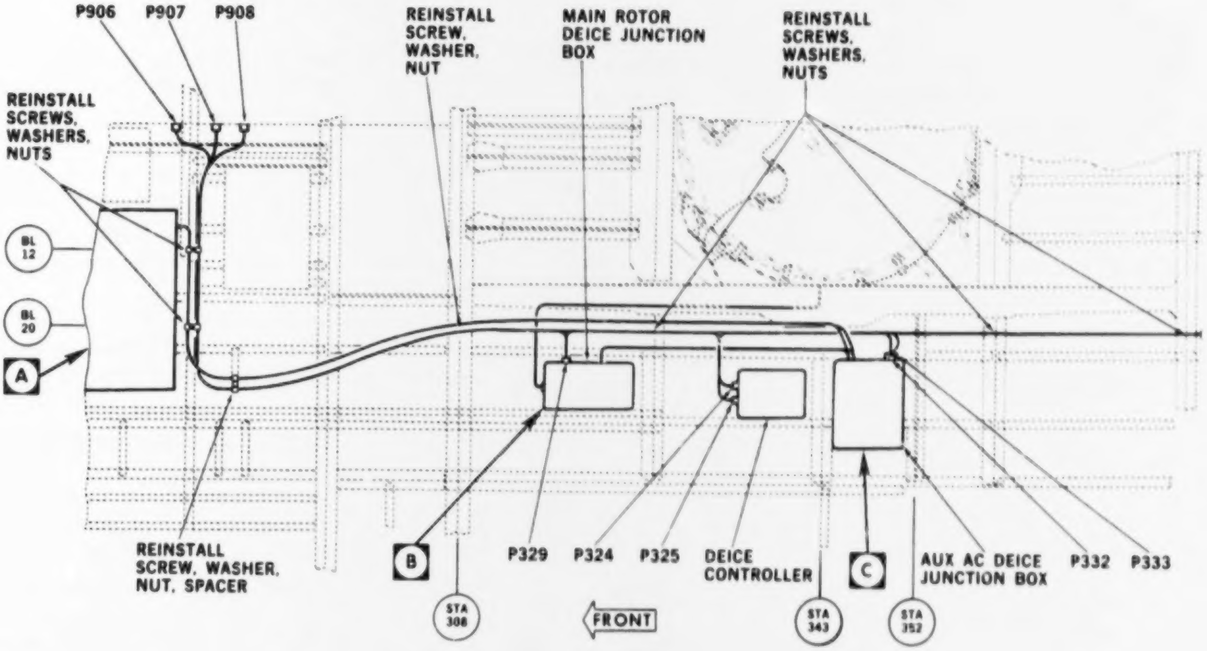
by. Reinstall helicopter harnesses on support at station 286 with screw, washer, nut,and spacer.

bz. Reinstall infrarea countermeasures wiring harness at stations 308, 327, 343, 360, 370, 379, and 390, with screws, washers, and nuts.

ca. Reinstall right main harness at station 327 with screw, washer, and nut.

cb. Reinstall right main harness at stations 403, 409, 421, 425, 433, 443, 455, 464, 467, and 479 with screws, washers, and nuts.

cc. Reinstall helicopter harness in tail cone at stations 505, 525, 545, 565, 585, 605, 624, and 635.


P906
P907
P908
REINSTALL SCREW, WASHER, NUT
MAIN ROTOR DEICE JUNCTION BOX
REINSTALL SCREWS, WASHERS, NUTS
REINSTALL SCREWS, WASHERS, NUTS
BL 12
BL 20
A
REINSTALL SCREW, WASHER, NUT, SPACER
B
STA 308
P329
P324
P325
DEICE CONTROLLER
FRONT
STA 343
C
STA 352
AUX AC DEICE JUNCTION BOX
P332
P333

S 53875.1 (C10)

CABIN CEILING - RIGHT SIDE LOOKING UP

FIGURE 12-46 (SHEET 1 OF 3)

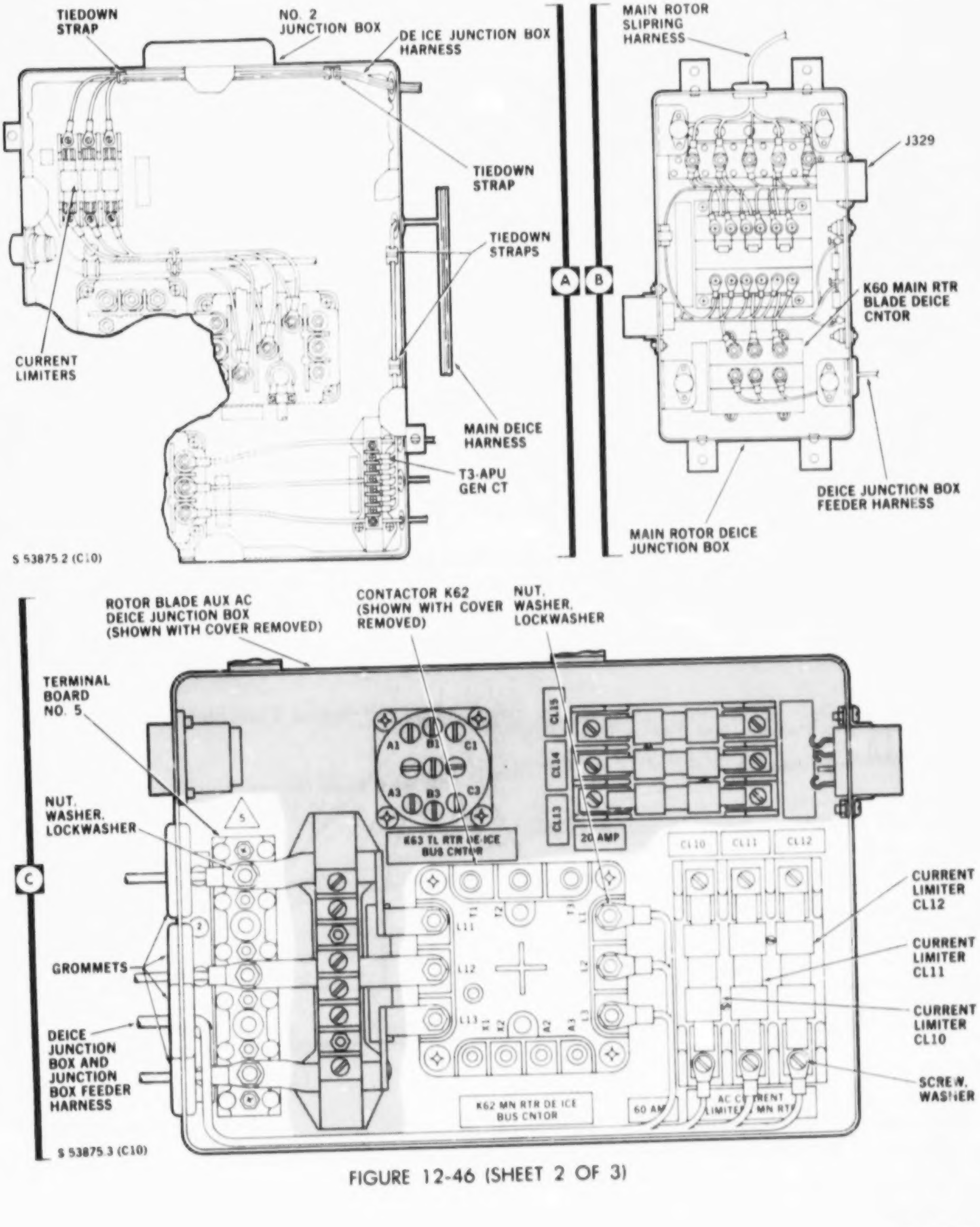
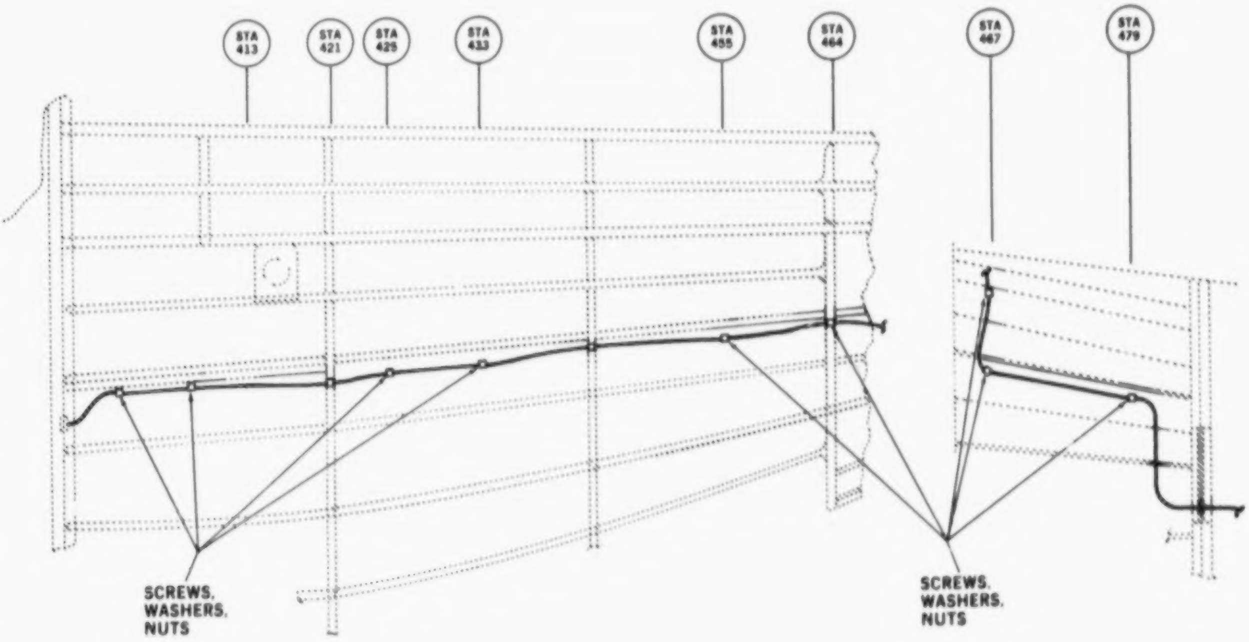

TIEDOWN STRAP
NO. 2 JUNCTION BOX
DE ICE JUNCTION BOX HARNESS
TIEDOWN STRAP
TIEDOWN STRAPS
CURRENT LIMITERS
MAIN DEICE HARNESS
T3-APU GEN CT
S 53875.2 (C10)
A
B
MAIN ROTOR SLIPRING HARNESS
J329
K60 MAIN RTR BLADE DEICE CNTOR
DEICE JUNCTION BOX FEEDER HARNESS
MAIN ROTOR DEICE JUNCTION BOX
C
ROTOR BLADE AUX AC DEICE JUNCTION BOX (SHOWN WITH COVER REMOVED)
CONTACTOR K62 (SHOWN WITH COVER REMOVED)
NUT, WASHER, LOCKWASHER
TERMINAL BOARD NO. 5
NUT, WASHER, LOCKWASHER
GROMMETS
DEICE JUNCTION BOX AND JUNCTION BOX FEEDER HARNESS
CL15
CL14
CL13
20 AMP
K63 TL RTR DE-ICE BUS CNTOR
A1
B1
C1
A3
B3
C3
T1
T2
T3
L1
L2
L3
L11
L12
L13
X1
X2
A2
A3
CL10
CL11
CL12
K62 MN RTR DE ICE BUS CNTOR
60 AMP
AC CURRENT LIMITER MN RTR
CURRENT LIMITER CL12
CURRENT LIMITER CL11
CURRENT LIMITER CL10
SCREW, WASHER
S 53875.3 (C10)

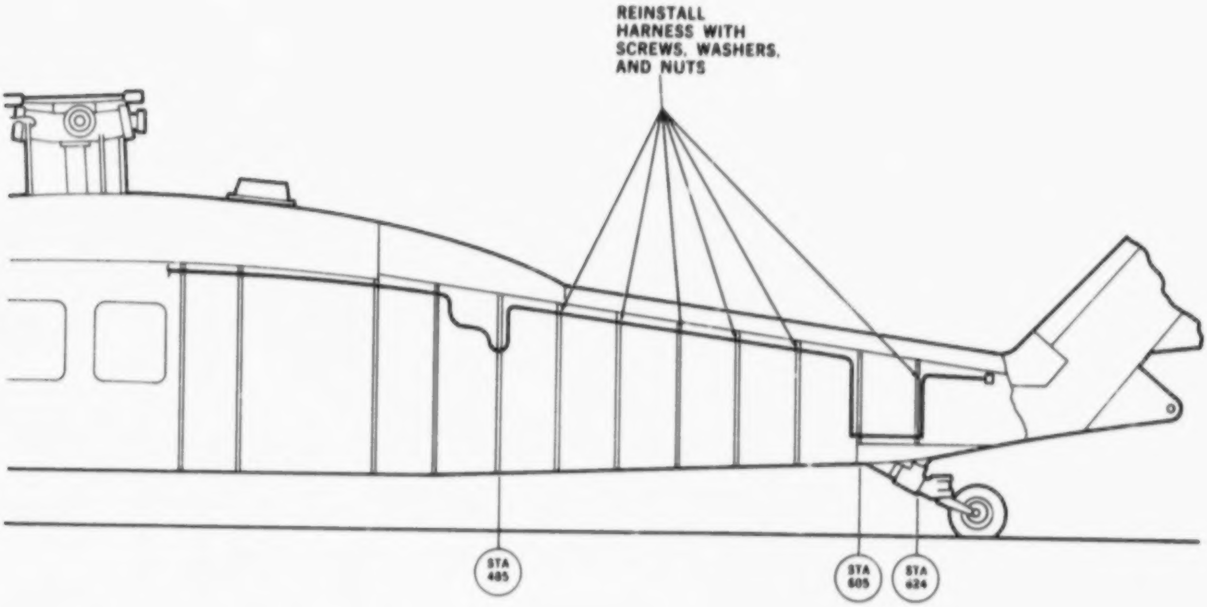
FIGURE 12-46 (SHEET 2 OF 3)

12-6.2 REMOVE 12-6.2


STA 413
STA 421
STA 425
STA 433
STA 455
STA 464
STA 467
STA 479
SCREWS, WASHERS, NUTS
SCREWS, WASHERS, NUTS

S 53875.4 (C10)

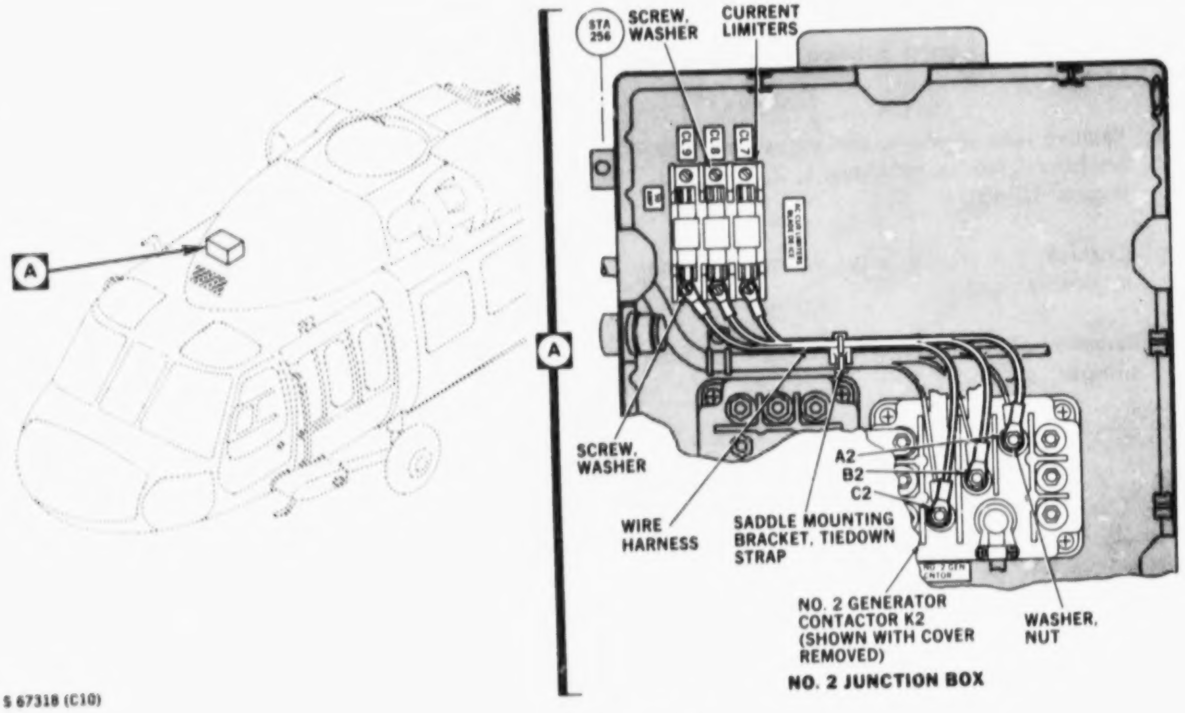
CABIN CEILING - RIGHT SIDE LOOKING UP


REINSTALL HARNESS WITH SCREWS, WASHERS, AND NUTS
STA 485
STA 605
STA 624

S 53875.5 (C10)

FIGURE 12-46 (SHEET 3 OF 3)

12-6.2 REMOVE


A
STA 256
SCREW, WASHER
CURRENT LIMITERS
CL 9
CL 8
CL 7
A
SCREW, WASHER
WIRE HARNESS
SADDLE MOUNTING BRACKET, TIEDOWN STRAP
A2
B2
C2
NO. 2 GENERATOR CONTACTOR K2 (SHOWN WITH COVER REMOVED)
WASHER, NUT
NO. 2 JUNCTION BOX

S 67318 (C10)

FIGURE 12-47

NO. 2 JUNCTION BOX MODIFICATION

cd. Unfasten and hang No. 2 junction box cover by chain.

ce. Remove screws and terminal cover from No. 2 generator contactor, K2 (Figure 12-47).

cf. Remove tiedown strap and saddle mounting bracket from deice wiring harness.

cg. Remove nuts, washers, and deice harness terminals from No. 2 generator contactor, K2, terminals, A2, B2, and C2.

ch. Remove screws, washers, and wires from terminals of CL7, CL8, and CL9.

ci. Remove deice harness from No. 2 junction box.

cj. Install screws and washers on terminals of CL7, CL8, and CL9.

ck. Install nuts and washers on No. 2 generator contactor, K2, terminals, A2, B2, and C2.

cl. Install terminal cover on No. 2 generator contactor, K2, with screws.

cm. Remove screws and current limiter holder from junction box.

cn. Secure cover to No. 2 junction box with fasteners.

12-6.2 REMOVE 12-6.2

MAIN ROTOR BLADE DEICE JUNCTION BOX

co. Unfasten and hang junction box cover by chain.

cp. Remove nuts, washers, and wires from terminal board, No. 3, terminals, 1, 2, 3, 4, and 5 (Figure 12-48).

cq. Carefully pull slipring wires through grommet in junction box.

cr. Remove bolt, washers, and ground wires from stringer.

cs. Install nuts and washers on terminals of terminal board, No. 3.

ct. Secure cover to junction box with fasteners.

cu. Remove screws and washers, and remove junction box.

BLADE DEICE CONTROLLER

cv. Remove screws, lockwashers, washers, and controller from mounting bracket (Figure 12-49).

12-6.2 REMOVE 12-6.2

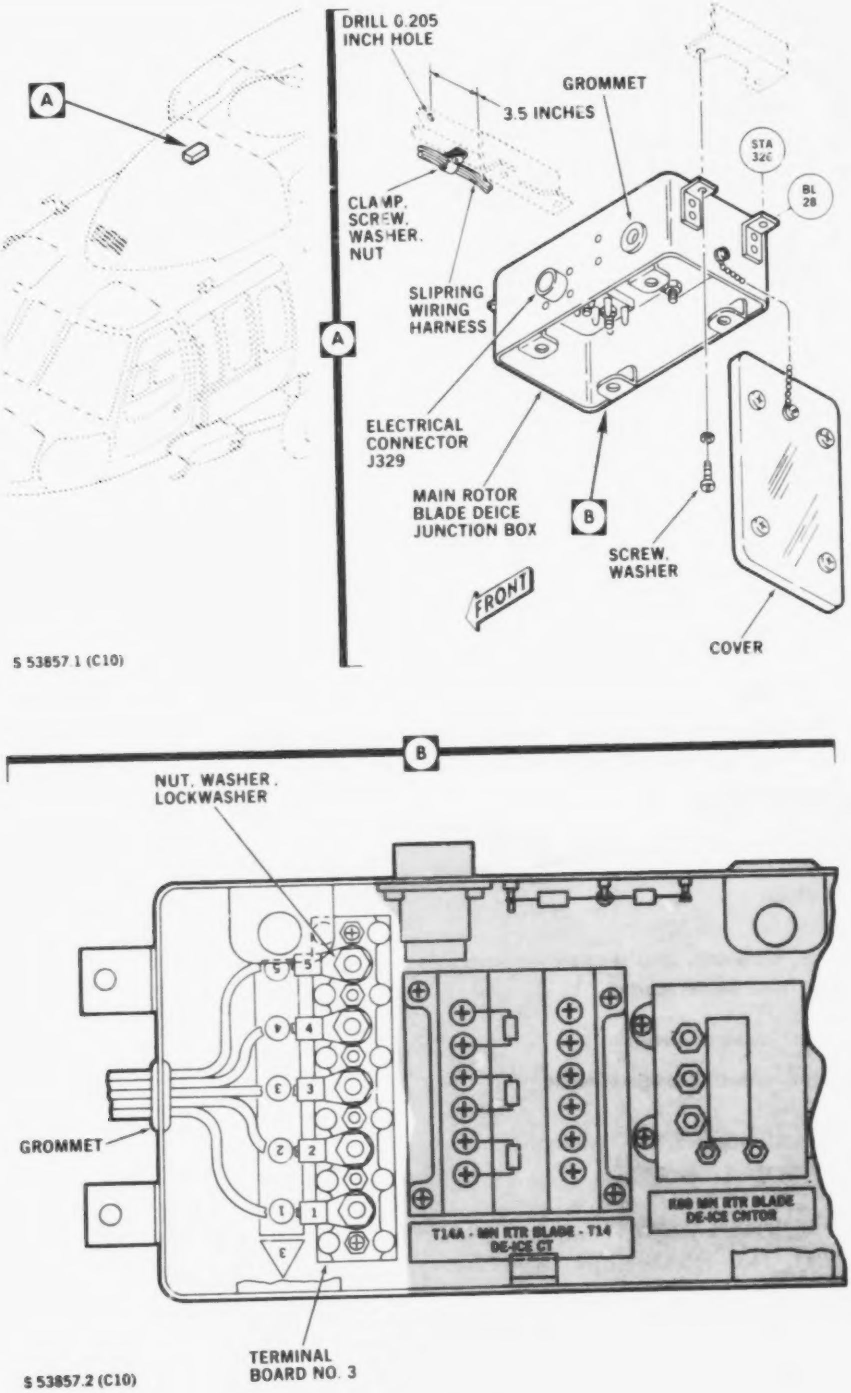

A
A
DRILL 0.205
INCH HOLE
3.5 INCHES
GROMMET
STA
320
BL
28
CLAMP,
SCREW,
WASHER,
NUT
SLIPRING
WIRING
HARNESS
ELECTRICAL
CONNECTOR
J329
MAIN ROTOR
BLADE DEICE
JUNCTION BOX
B
SCREW,
WASHER
FRONT
COVER
S 53857.1 (C10)
B
NUT, WASHER,
LOCKWASHER
5
4
3
2
1
GROMMET
T14A - MN RTR BLADE - T14
DE-ICE CT
K60 MN RTR BLADE
DE-ICE CNTOR
3
TERMINAL
BOARD NO. 3
S 53857.2 (C10)

FIGURE 12-48

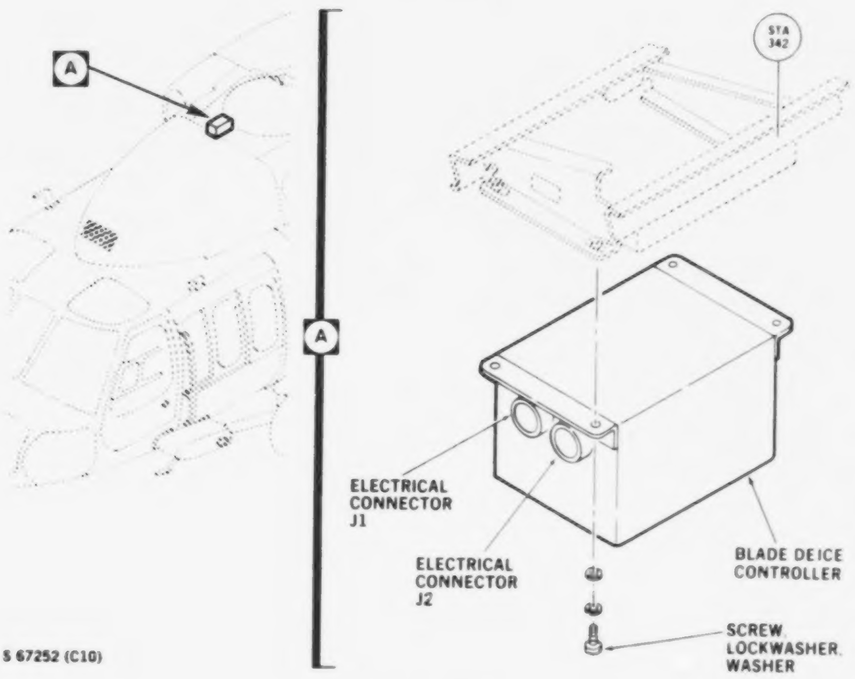

A
A
STA 342
ELECTRICAL CONNECTOR J1
ELECTRICAL CONNECTOR J2
BLADE DEICE CONTROLLER
SCREW, LOCKWASHER, WASHER
S 67252 (C10)

FIGURE 12-49

AUXILIARY AC JUNCTION BOX

cw. Unfasten and hang auxiliary ac junction box cover by chain.

cx. Remove nuts, washers, and wires from terminal board, No. 5, terminals, 1, 3, and 5 (Figure 12-50).

cy. Carefully pull wires through grommets.

cz. Install nuts and washers on terminal board, No. 5, terminals, 1, 3, and 5.

da. Remove bolt, washers, wires, No. H6434A20N, No. H6434B20N, wire No. H6435A20N, and nut from airframe ground.

db. Remove screws, washers, and junction box from cabin ceiling.

dc. Secure cover to junction box with fasteners.

dd. Using nuts and washers, connect wires to terminal board, No. 15, as follows:

WIRE CODE	TO	TERMINAL NO.
X8D06A		1
X8E06A		1
X9D06B		2
X9E06B		2
X10D06C		3
X10E06C		3

12-6.2 REMOVE 12-6.2

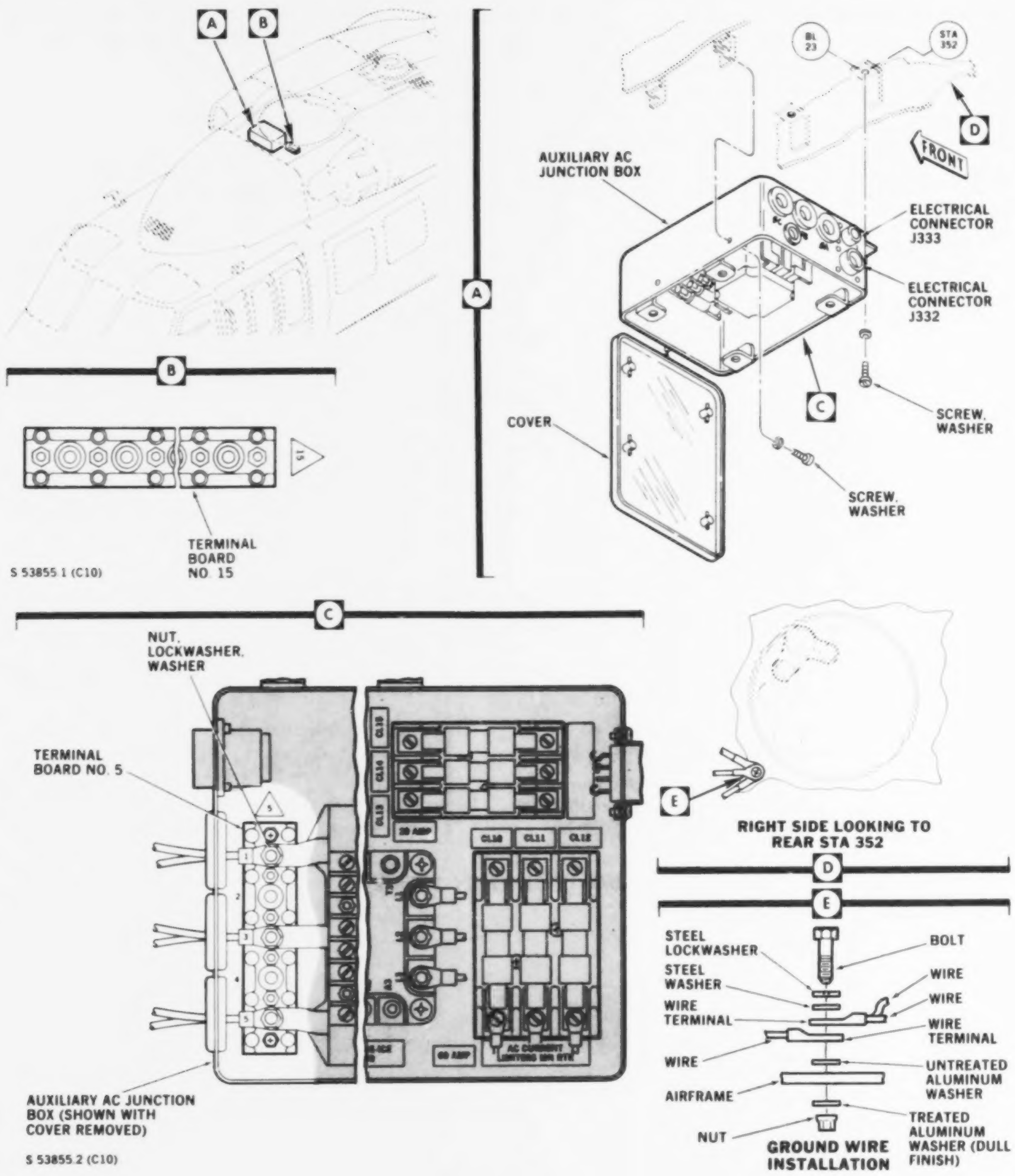

A
B
A
BL 23
STA 352
D
FRONT
AUXILIARY AC JUNCTION BOX
ELECTRICAL CONNECTOR J333
ELECTRICAL CONNECTOR J332
C
SCREW, WASHER
COVER
SCREW, WASHER
B
15
TERMINAL BOARD NO. 15
S 53855.1 (C10)
C
NUT, LOCKWASHER, WASHER
TERMINAL BOARD NO. 5
5
CL15
CL14
CL13
20 AMP
CL10
CL11
CL12
60 AMP
AC CURRENT LIMITERS
E
RIGHT SIDE LOOKING TO REAR STA 352
D
E
STEEL LOCKWASHER
STEEL WASHER
WIRE TERMINAL
WIRE
AIRFRAME
NUT
BOLT
WIRE
WIRE
WIRE TERMINAL
UNTREATED ALUMINUM WASHER
TREATED ALUMINUM WASHER (DULL FINISH)
GROUND WIRE INSTALLATION
AUXILIARY AC JUNCTION BOX (SHOWN WITH COVER REMOVED)
S 53855.2 (C10)

FIGURE 12-50

12-6.2 REMOVE 12-6.2

BLADE DEICE CONTROL PANEL

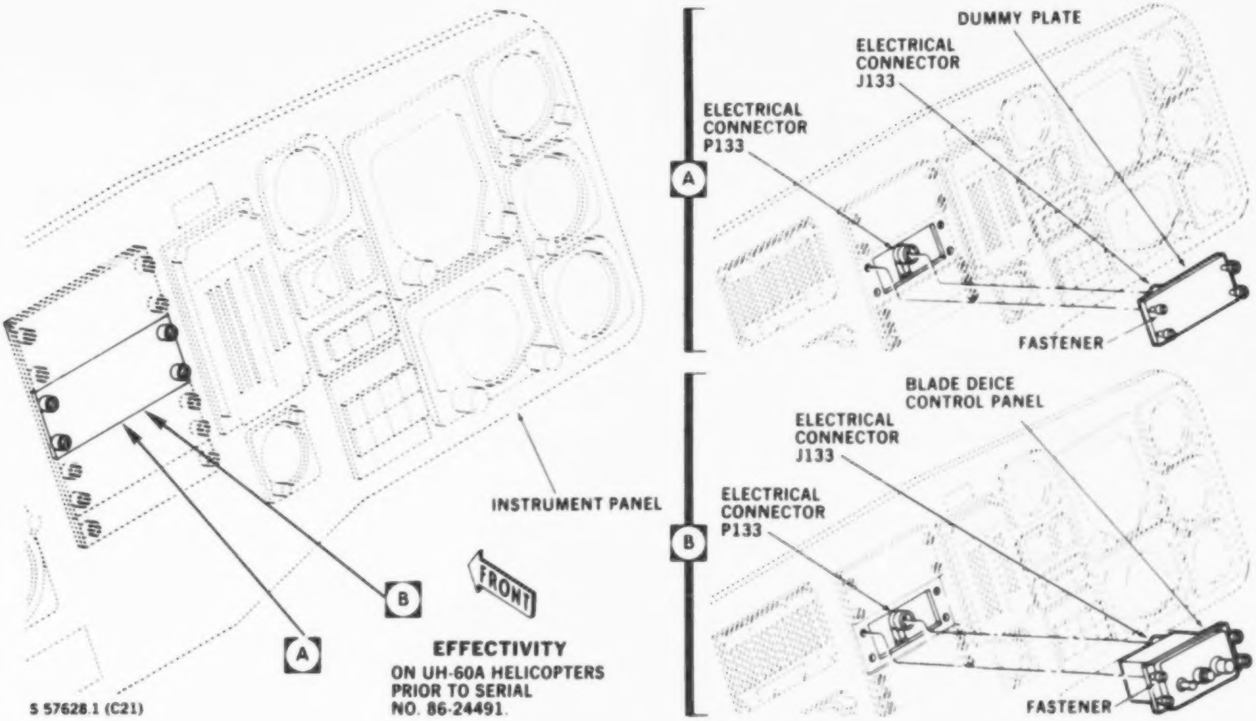
de. Loosen fasteners on blade deice control panel (Figure 12-51, Sheet 1 and Sheet 2).

df. Lift control panel slowly from instrument panel until electrical connector is exposed.

dg. Support control panel while disconnecting electrical connector, P133, from rear of panel.

dh. Connect electrical connector, P133, to dummy plate.

di. Fasten dummy plate to instrument panel.


A
B
INSTRUMENT PANEL
FRONT
S 57628.1 (C21)
A
DUMMY PLATE
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
FASTENER
B
BLADE DEICE CONTROL PANEL
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
FASTENER

EFFECTIVITY
ON UH-60A HELICOPTERS
PRIOR TO SERIAL
NO. 86-24491.

FIGURE 12-51 (SHEET 1 OF 2)

12-6.2 REMOVE 12-6.2

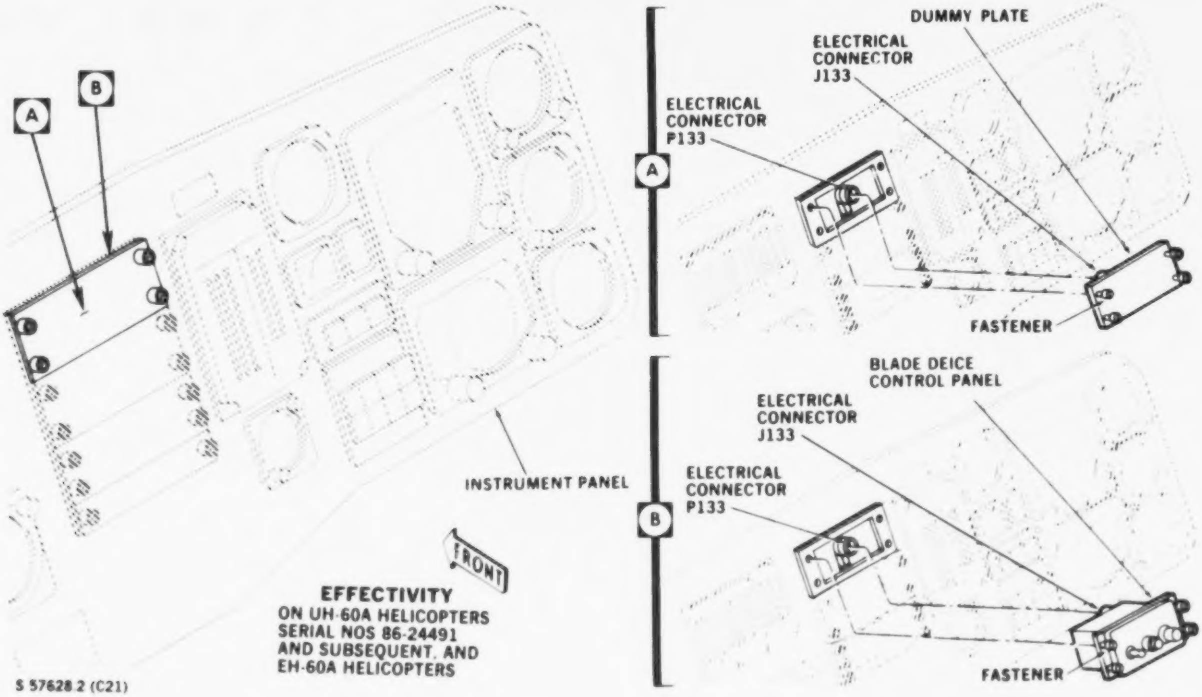

A
B
INSTRUMENT PANEL
FRONT
EFFECTIVITY
ON UH-60A HELICOPTERS
SERIAL NOS 86-24491
AND SUBSEQUENT, AND
EH-60A HELICOPTERS
S 57628.2 (C21)
A
DUMMY PLATE
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
FASTENER
B
BLADE DEICE CONTROL PANEL
ELECTRICAL CONNECTOR J133
ELECTRICAL CONNECTOR P133
FASTENER

FIGURE 12-51 (SHEET 2 OF 2)

BLADE DEICE TEST PANEL

dj. Loosen fasteners on blade deice test panel (Figure 12-52).

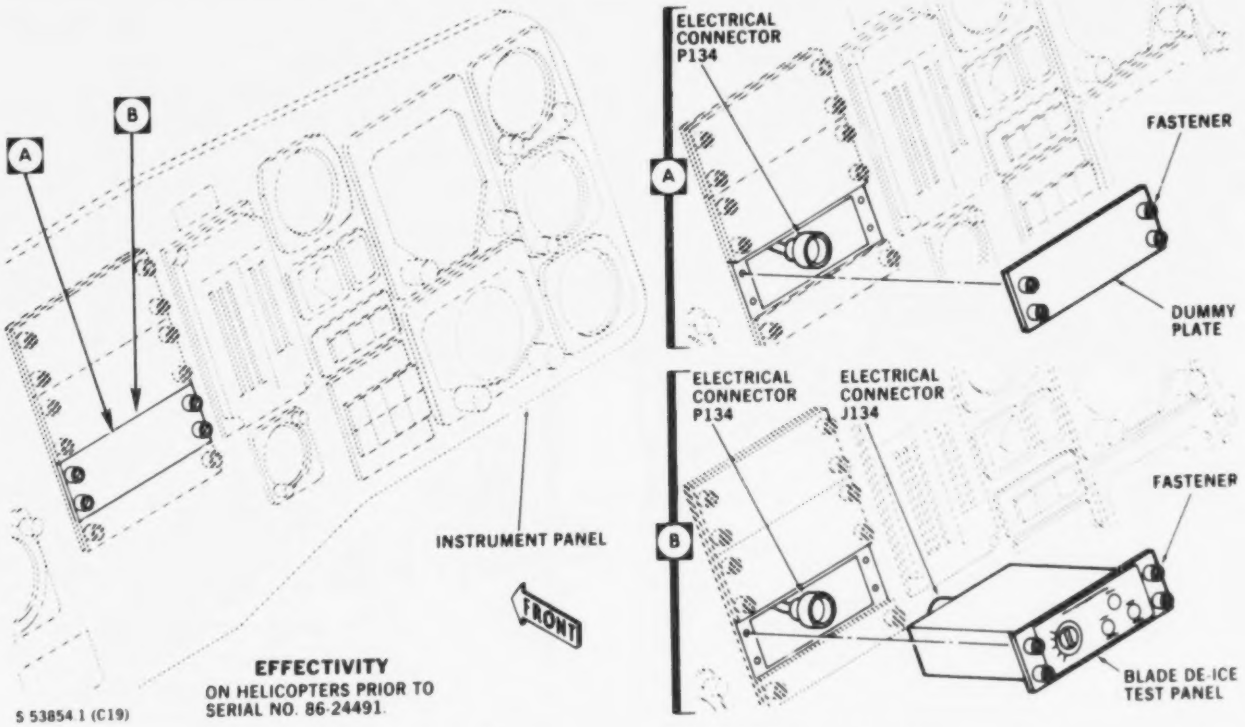
dk. Lift test panel slowly from instrument panel until electrical connector is exposed.

dl. Support test panel while disconnecting electrical connector, P134, from rear of test panel.

dm. Connect electrical connector, P134, to dummy plate.

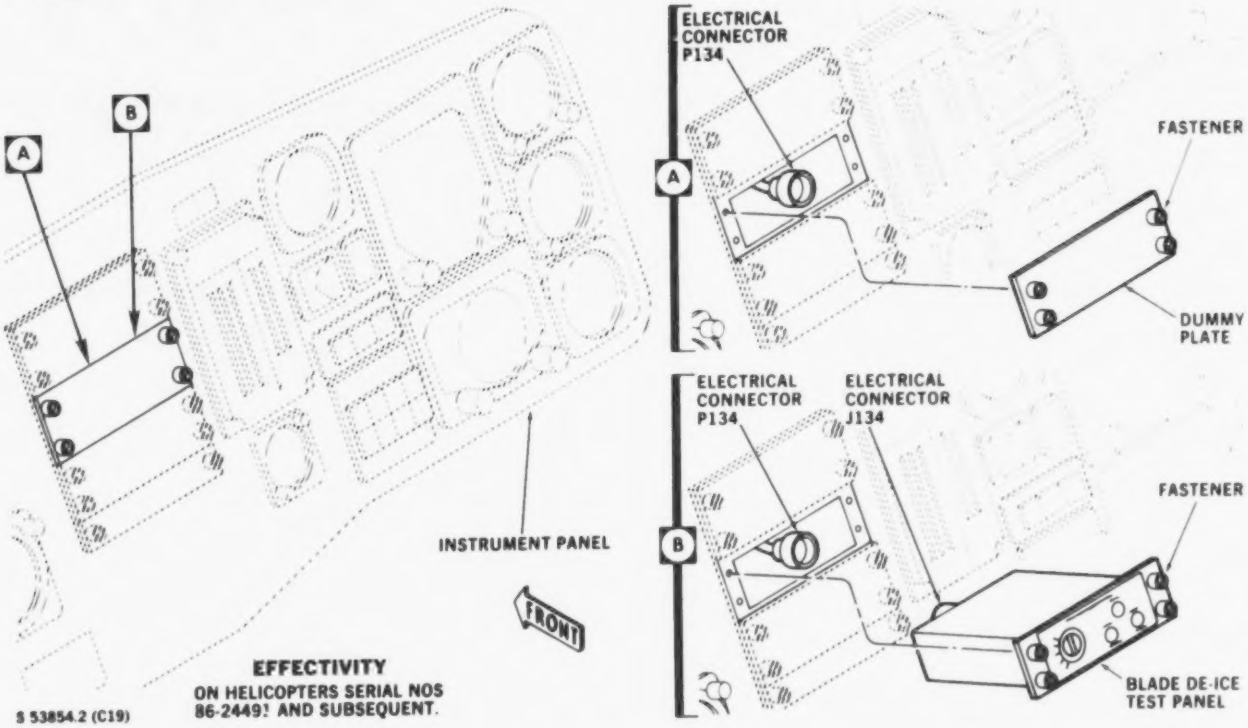
dn. Fasten dummy plate to instrument panel.

12-6.2 REMOVE 12-6.2


A
B
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P134
A
FASTENER
DUMMY PLATE
ELECTRICAL CONNECTOR P134
ELECTRICAL CONNECTOR J134
B
FASTENER
BLADE DE-ICE TEST PANEL

EFFECTIVITY
ON HELICOPTERS PRIOR TO SERIAL NO. 86-24491.

S 53854.1 (C19)


A
B
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P134
A
FASTENER
DUMMY PLATE
ELECTRICAL CONNECTOR P134
ELECTRICAL CONNECTOR J134
B
FASTENER
BLADE DE-ICE TEST PANEL

EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.

S 53854.2 (C19)

FIGURE 12-52

12-6.2 REMOVE 12-6.2

ICING RATE METER

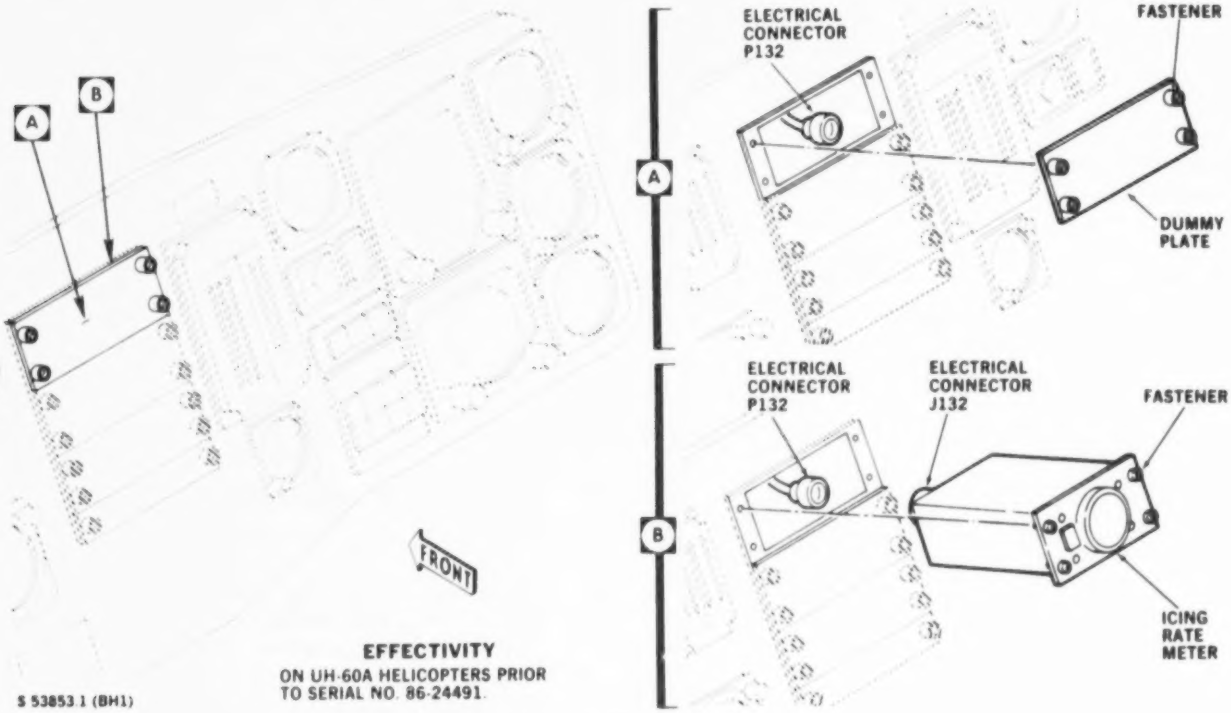
do. Loosen fasteners on icing rate meter (Figure 12-53, Sheet 1 and Sheet 2).

dp. Lift icing rate meter slowly from instrument panel until electrical connector is exposed.

dq. Support icing rate meter while disconnecting electrical connector, P132, from rear of meter.

dr. Connect electrical connector, P132, to dummy plate.

ds. Fasten dummy plate to instrument panel.

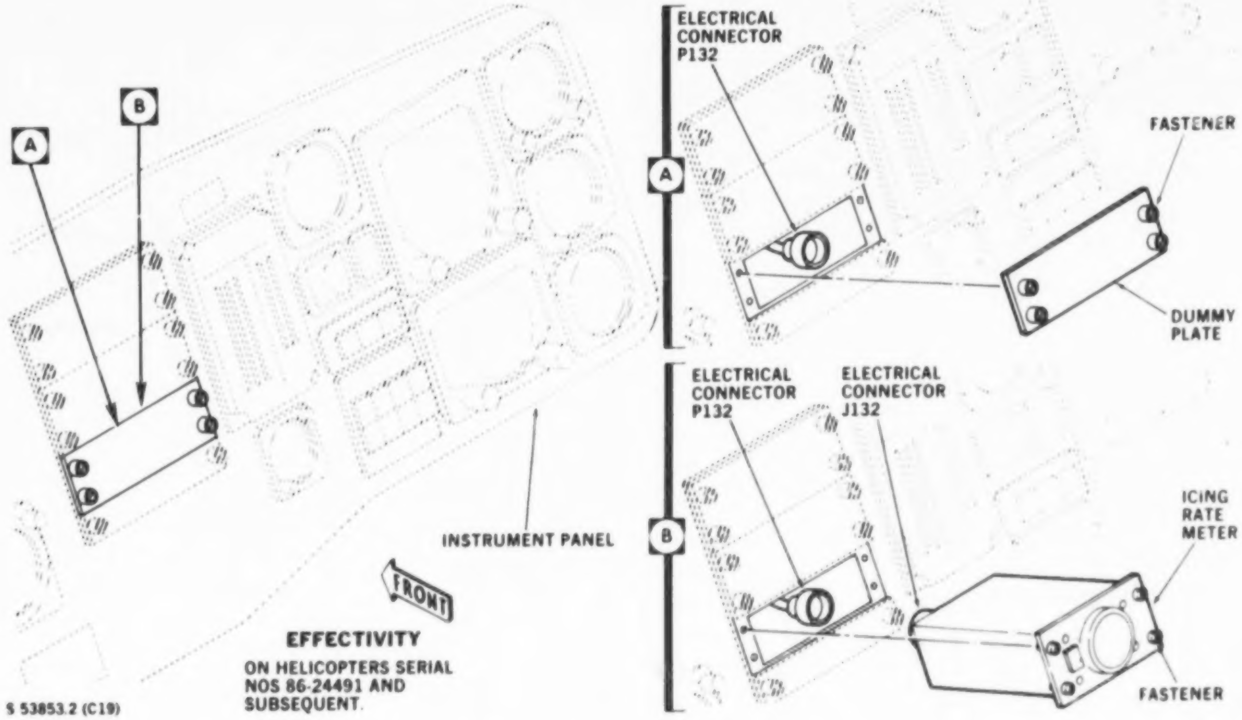

B
A
FRONT
A
ELECTRICAL CONNECTOR P132
FASTENER
DUMMY PLATE
B
ELECTRICAL CONNECTOR P132
ELECTRICAL CONNECTOR J132
FASTENER
ICING RATE METER

EFFECTIVITY
ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 86-24491.

S 53853.1 (BH1)

FIGURE 12-53 (SHEET 1 OF 2)

12-6.2 REMOVE 12-6.2


A
B
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P132
FASTENER
DUMMY PLATE
A
ELECTRICAL CONNECTOR P132
ELECTRICAL CONNECTOR J132
ICING RATE METER
FASTENER
B
S 53853.2 (C19)

EFFECTIVITY

ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.

FIGURE 12-53 (SHEET 2 OF 2)

MAIN GEAR BOX MODIFICATION

dt. Drain main gear box (PARA 6-1).

du. Remove clamp, screw, washer, and nut holding slipring harness to bulkhead at station 327 (Figure 12-54, Sheet 1).

dv. Remove screw, lockwasher, washer, spacer, and clamp holding slipring harness to sump at right oil pump. Reinstall module wiring harness to oil pump with screw and washer.

dw. Remove screw and clamp holding slipring harness to bracket on sump.

dx. Make sure harness has been removed from main rotor deice junction box. Pull harness through bulkhead at station 247. Pull harness through grommet in main transmission beam, station 340, buttline 16.5, and remove grommet.

12-6.2 REMOVE 12-6.2

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

dy. Clean sealing compound from wiring harness and grommet with cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

dz. Remove nuts and washers holding sump brackets on flange seal, and remove both brackets.

NOTE

Remove harness and droop stop heaters from all spindles and blades.

ea. Disconnect electrical connectors, P841, P842, P843, and P844, from blades (Figure 12-54, Sheet 2).

eb. Disconnect electrical connectors from heater droop stop pins.

ec. Install caps on rotor blade electrical connectors. Lockwire, Item 199, Appendix D, caps to screws.

ed. Remove screw, washer, nut, clamps, and harnesses from brackets on spindle.

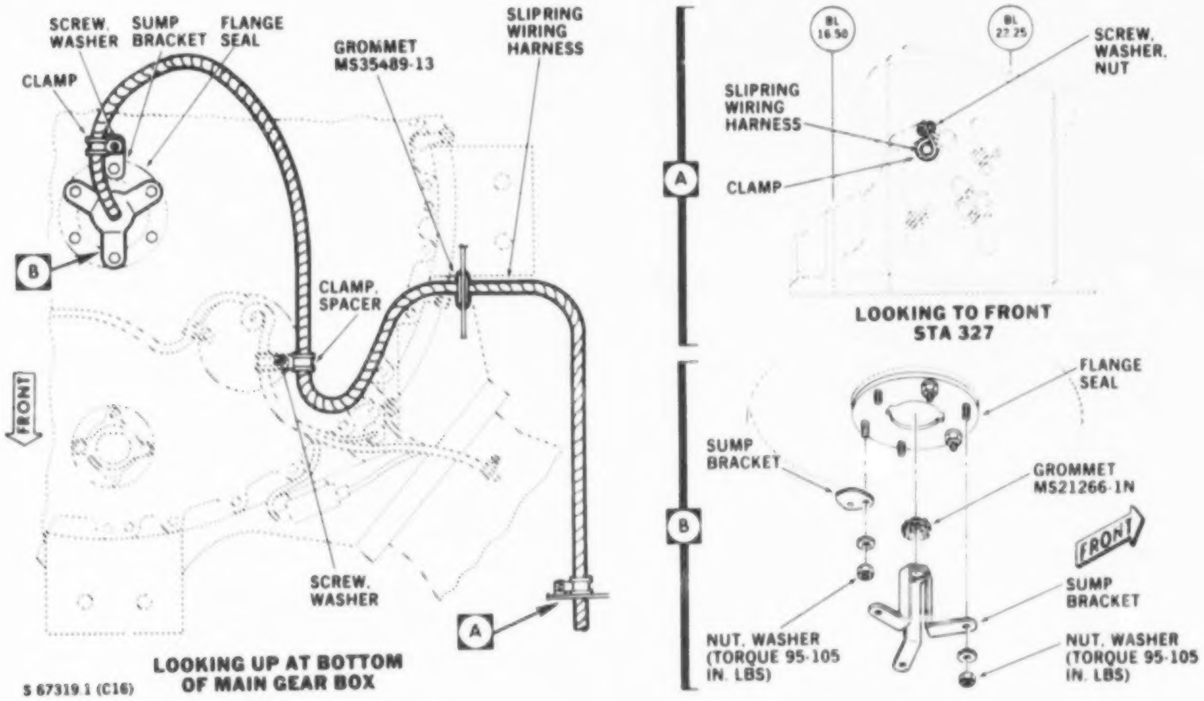

SCREW, WASHER
SUMP BRACKET
FLANGE SEAL
GROMMET MS35489-13
SLIPRING WIRING HARNESS
CLAMP
B
CLAMP, SPACER
FRONT
SCREW, WASHER
A
LOOKING UP AT BOTTOM OF MAIN GEAR BOX
S 67319.1 (C16)
BL 16.50
BL 22.25
SCREW, WASHER, NUT
SLIPRING WIRING HARNESS
A
CLAMP
LOOKING TO FRONT STA 327
FLANGE SEAL
SUMP BRACKET
GROMMET MS21266-1N
B
FRONT
SUMP BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
NUT, WASHER (TORQUE 95-105 IN. LBS)

FIGURE 12-54 (SHEET 1 OF 5)

12-6.2 REMOVE 12-6.2

ee. Remove cotter pin.

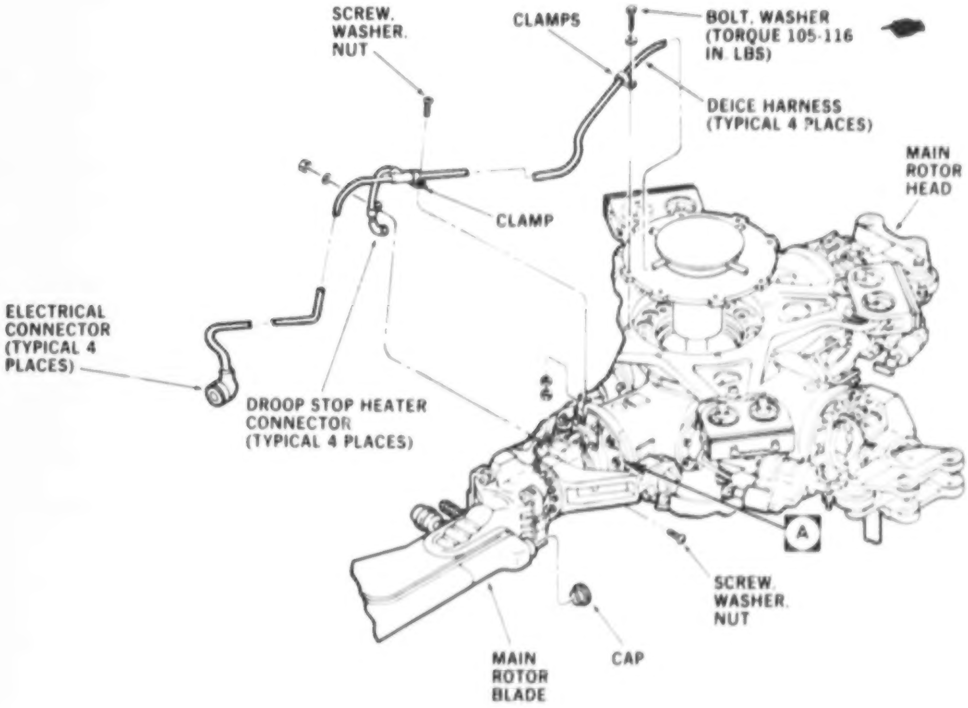
ef. Push heater pin from droop stop with normal pin (Figure 12-54, Sheet 3).

eg. Install cotter pin, MS24665-306.

eh. Remove bolts and brackets from spindle bearing endplate.

ei. Coat threads, shank, and area under bolthead with primer, Item 277, Appendix D.

ej. Replace bolt, adding countersunk washers. Make sure countersunk side of washer is next to bolthead.


SCREW, WASHER, NUT
CLAMPS
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DEICE HARNESS (TYPICAL 4 PLACES)
MAIN ROTOR HEAD
CLAMP
ELECTRICAL CONNECTOR (TYPICAL 4 PLACES)
DROOP STOP HEATER CONNECTOR (TYPICAL 4 PLACES)
A
SCREW, WASHER, NUT
MAIN ROTOR BLADE
CAP

UH60A-67319.2 (BH6)

FIGURE 12-54 (SHEET 2 OF 5)

ek. Before torquing spindle attachment bolt, check threaded insert that bolt goes into, as follows:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Thread bolt and washer in until head is 0.030 inch away from surface of washer. Using dial-type torque wrench, unthread bolt. **MINIMUM BREAKAWAY TORQUE IS 14 INCH-POUNDS. MAXIMUM REMOVAL TORQUE IS 150 INCH-POUNDS.** If torque is not within these limits, check condition of bolt for corrosion and wear. If corrosion or wear is evident, try a new bolt. Check insert for cleanness. If insert is dirty, clean with cheesecloth moistened with methyl ethyl ketone, Item 233, Appendix D. If breakaway or removal torque is still not acceptable, replace insert (PARA 5-5). **TORQUE BOLT TO 912 - 1008 INCH-POUNDS.**

el. Seal boltheads with sealing compound, Item 312, Appendix D. Touch up paint on boltheads as necessary (PARA 2-5).

em. Remove bolts, washers, and clamps holding distributor to bifilar (Figure 12-54, Sheet 5).

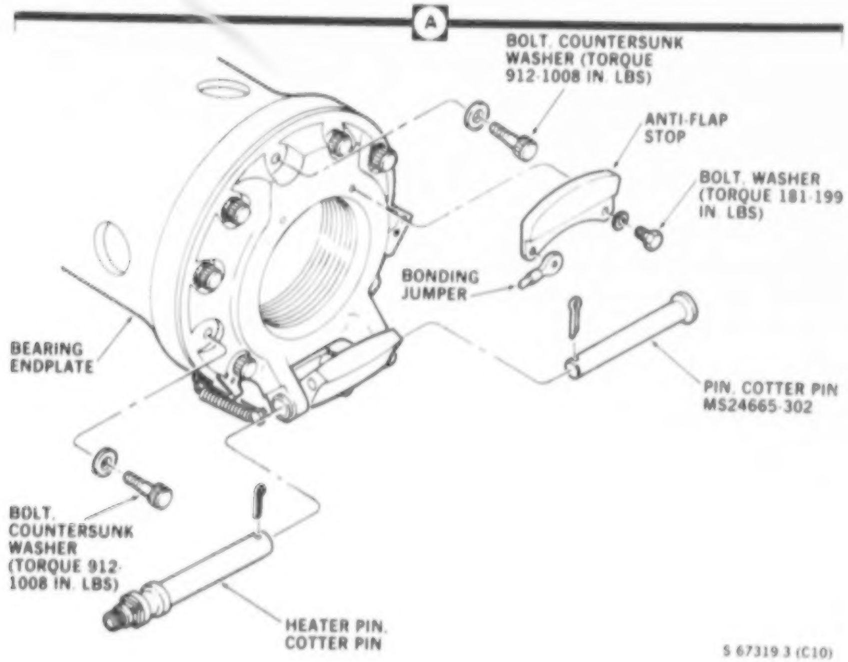

A
BOLT, COUNTERSUNK WASHER (TORQUE 912-1008 IN. LBS)
ANTI-FLAP STOP
BOLT, WASHER (TORQUE 181-199 IN. LBS)
BONDING JUMPER
BEARING ENDPLATE
PIN, COTTER PIN MS24665-302
BOLT, COUNTERSUNK WASHER (TORQUE 912-1008 IN. LBS)
HEATER PIN, COTTER PIN
S 67319 3 (C10)

FIGURE 12-54 (SHEET 3 OF 5)

en. Carefully lift distributor and slipring from rotorhead. Have assistant in cabin feed slipring harness through tube. Remove distributor and slipring from helicopter.

eo. Remove and discard packing from slipring.

ep. Loosen nuts on distributor terminal board. Remove bolts and washers, and separate distributor and slipring.

eq. Reach inside main rotor shaft and remove tube. Remove and discard packing from bottom of tube.

er. To install shaft plug, do this:

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

(1) Clean areas to be bonded with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

(2) Apply thin coat of primer, Item 272, Appendix D, to bonding surfaces. Allow to cure at least 1 hour at 70° - 75°F (21° - 23°C).

(3) Apply adhesive, Item 31, Appendix D to bonding surfaces. Use sand bag to weight shaft plug. Allow adhesive to cure for 2 hours at 110° - 130°F (43° - 54°C), or for 24 hours at 70° - 75°F (21° - 23°C).

es. Coat shank, threads, and area under head of bifilar bolts with primer, Item 277, Appendix D.

et. Place bifilar cover over bifilar and install bolts and washers while primer is still wet. **TORQUE BOLTS TO 38 - 42 INCH-POUNDS.**

eu. Wipe off any primer that has seeped from under boltheads.

ev. Touch up paint on boltheads as necessary (PARA 2-5).

ew. Apply sealing compound, Item 312, Appendix D, around edge of bifilar cover and areas around bifilar boltheads.

ex. Remove nuts, washers, and flange seal from main module sump (Figure 12-54, Sheet 4).

ey. Place packing, M83248/1-234, lubricated with lubricating oil, Item 221, Appendix D, on sump access cover.

ez. Install access cover on sump with nuts and washers. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

fa. Service main module (PARA 1-4.1).

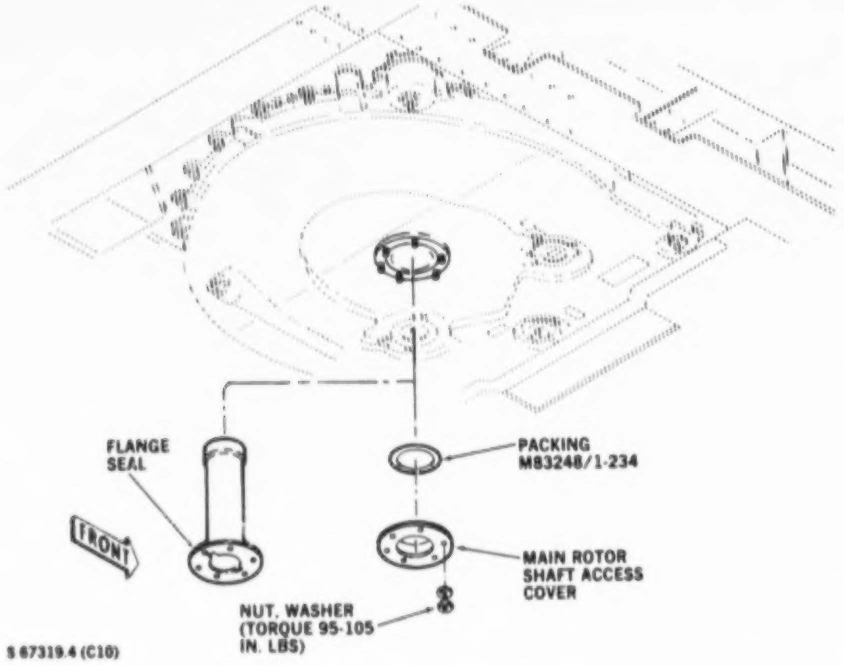

FLANGE
SEAL
PACKING
M83248/1-234
FRONT
MAIN ROTOR
SHAFT ACCESS
COVER
NUT, WASHER
(TORQUE 95-105
IN. LBS)
S 67319.4 (C10)

FIGURE 12-54 (SHEET 4 OF 5)

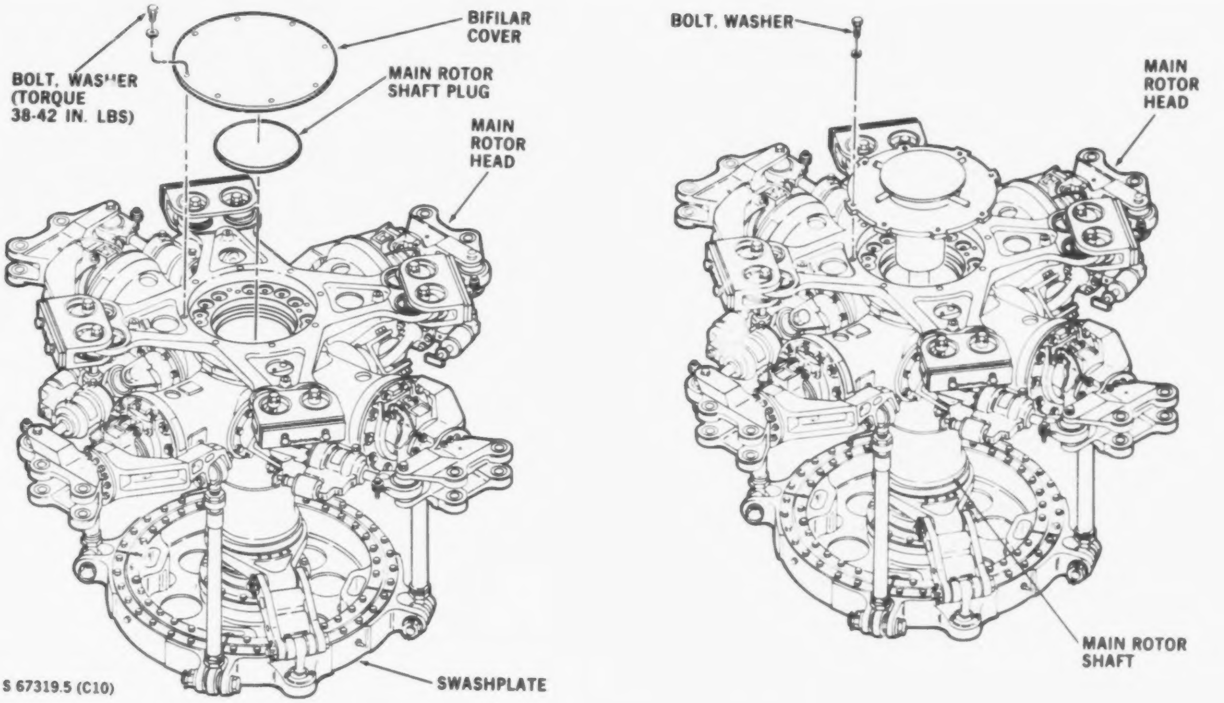

BOLT, WASHER (TORQUE 38-42 IN. LBS)
BIFILAR COVER
MAIN ROTOR SHAFT PLUG
MAIN ROTOR HEAD
SWASHPLATE
S 67319.5 (C10)
BOLT, WASHER
MAIN ROTOR HEAD
MAIN ROTOR SHAFT

FIGURE 12-54 (SHEET 5 OF 5)

INSTALL PANELS

fb. Turn off all electrical power.

fc. Install tail gear box cover, 5T-6T-12, on tail pylon. Fasten quarter-turn fasteners.

fd. Hinge tail pylon drive shaft cover, 5T-6T-11, closed. Fasten quarter-turn fasteners.

fe. Install access panels, 5T-5B-18 and 6T-6B-32, on rear tail cone with screws and washers.

ff. Install intermediate gear box cover, 5T-6T-17, on tail cone. Fasten quarter-turn fasteners.

fg. Install cargo netting on right rear stowage compartment.

fh. Install soundproofing on right side stowage compartment (PARA 2-32).

fi. Install soundproofing on right side cabin ceiling from station 247 to 398, buttline 0, to right edge of cabin (PARA 2-32).

fj. Install troop seats in cabin (PARA 2-23).

fk. Balance main and tail rotors (PARA 5-18 and PARA 5-26)

fl. Store deice kit (TM 38-230-1).

12-6.3 REPLACE FLANGE SEAL AND PACKING 12-6.3

WARNING

Injury to personnel and damage to equipment will occur if main rotor head turns while maintenance is being performed on this area. Personnel or tools may come in contact with moving parts. Make sure gust lock is engaged before beginning maintenance on this area.

REMOVE

a. Turn off all electrical power.

b. Remove main transmission drip pan from cabin ceiling (PARA 2-34, PARA 2-35, or PARA 2-36).

c. Drain oil from main transmission gear box (PARA 6-1).

d. Disconnect ground wire, No. 1-20-S3, next to main junction box, from airframe ground.

e. Unfasten and hang main junction box cover by chain.

f. Disconnect slipring harness wires from junction box terminal board, No. 3, and pull wires out through grommet.

g. Remove wire harness clamps, as required, to free harness.

h. Remove anti-chaff strip from wire harness.

i. Pull harness through clamps and grommet until it hangs down from conduit bracket at flange seal. Cut harness tiedown straps as required to free harness.

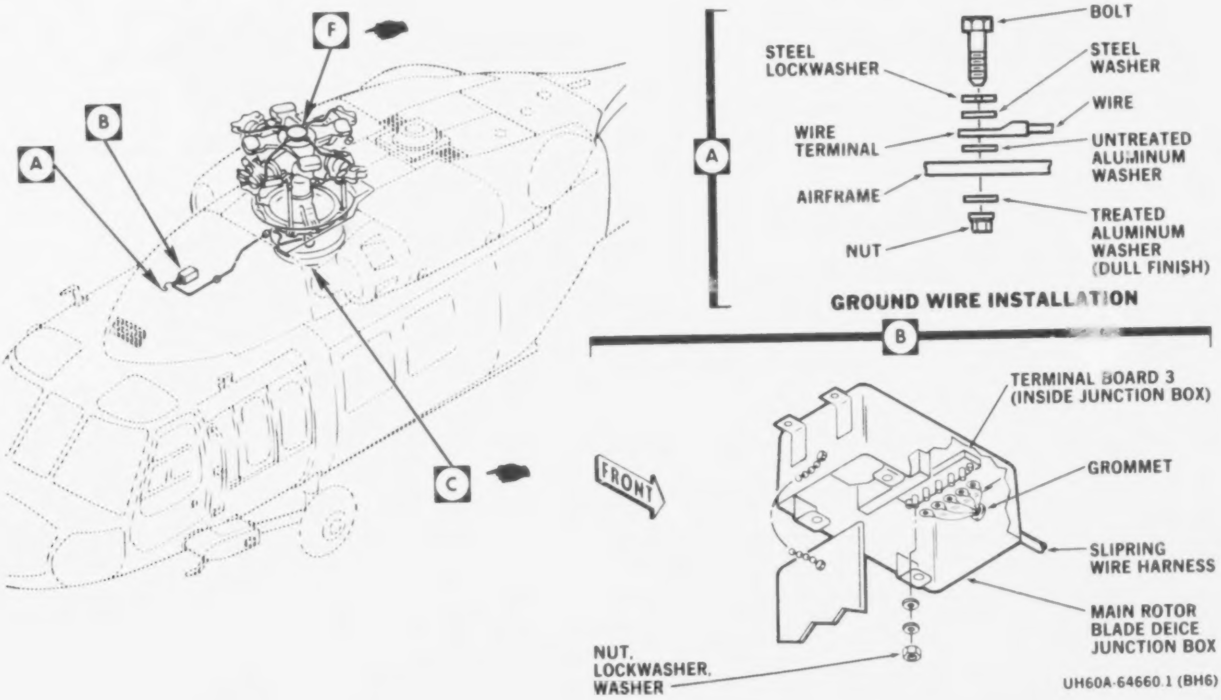

F
B
A
C
BOLT
STEEL LOCKWASHER
STEEL WASHER
WIRE
WIRE TERMINAL
UNTREATED ALUMINUM WASHER
A
AIRFRAME
NUT
TREATED ALUMINUM WASHER (DULL FINISH)
GROUND WIRE INSTALLATION
B
TERMINAL BOARD 3 (INSIDE JUNCTION BOX)
FRONT
GROMMET
SLIPRING WIRE HARNESS
MAIN ROTOR BLADE DEICE JUNCTION BOX
NUT, LOCKWASHER, WASHER
UH60A-64660.1 (BH6)

FIGURE 12-55 (SHEET 1 OF 4)

j. On UH-60A and EH-60A helicopters, remove conduit bracket as follows:

  (1) Mark flange seal studs used to mount conduit and clamp brackets.

  (2) Remove nuts mounting conduit bracket to flange seal. Do not remove remaining flange seal mounting nuts now.

k. On UH-60L helicopters, remove bolts mounting conduit bracket to flange seal.

l. Slide conduit bracket off slipring wire harness.

m. Disconnect electrical connectors, P841, P842, P843, and P844, from main rotor blades.

n. Disconnect electrical connectors, P845, P846, P847, and P848, from droop stop heater pins.

o. Remove deice wire harness clamps from brackets at each main rotor spindle.

p. Remove bolts mounting distributor to bifilar.

q. Carefully lift distributor and slipring assembly from rotor head. Have assistant in cabin feed slipring wire harness through tube assembly.

r. Remove and discard slipring packing.

s. Set distributor and slipring assembly to one side. Be careful not to damage assembly.

t. Reach inside rotor shaft and remove tube assembly.

u. Remove and discard packing at bottom of tube assembly.

v. Inspect tube assembly anti-torque coupling for loose bolts, and bent or cracked flexible disc. Replace tube assembly when worn or damaged.

w. Remove mounting nuts from flange seal.

x. Remove flange seal from transmission.

y. Remove and discard flange seal packing.

INSTALL

z. Turn off all electrical power.

aa. Inspect distributor packing for cracks and/or decay. Replace packing, 29579-2, when cracks and/or decay are visible.

ab. Check bifilar/distributor mating surfaces for cleanness.

ac. On UH-60A and EH-60A helicopters, install packing, M83248/1-234, lubricated with lubricating oil, Item 221, Appendix D, on flange seal.

ac.1. On UH-60L helicopters, install packing, M83248/1-263, lubricated with lubricating oil, Item 221, Appendix D.

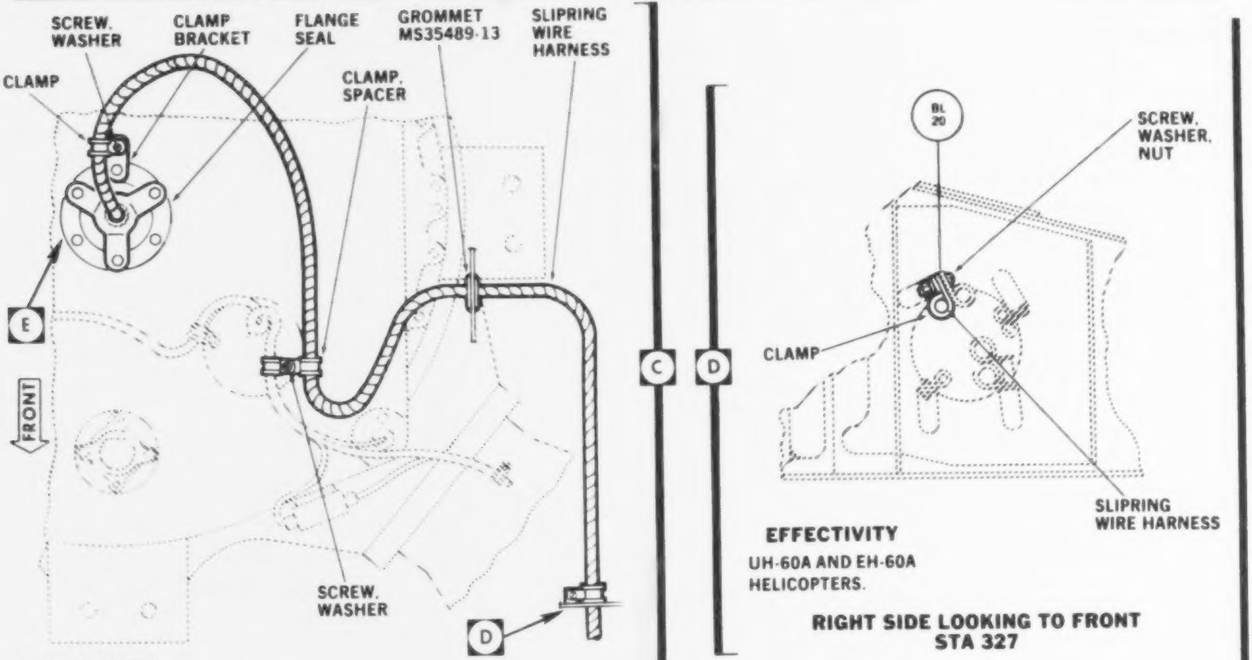
ad. Coat end of flange seal, opposite flange, with lubricating oil, Item 221, Appendix D.

CAUTION

A spring-loaded oil seal, in the rotor shaft, can be damaged if flange seal is installed crooked. Take care to install flange seal straight into sump.

ae. Carefully install flange seal on sump. If binding occurs, flange seal is not lined up with rotor shaft oil seal. Straighten flange seal and slowly turn flange while pressing it into rotor shaft.

12-6.3 REPLACE FLANGE SEAL AND PACKING 12-6.3

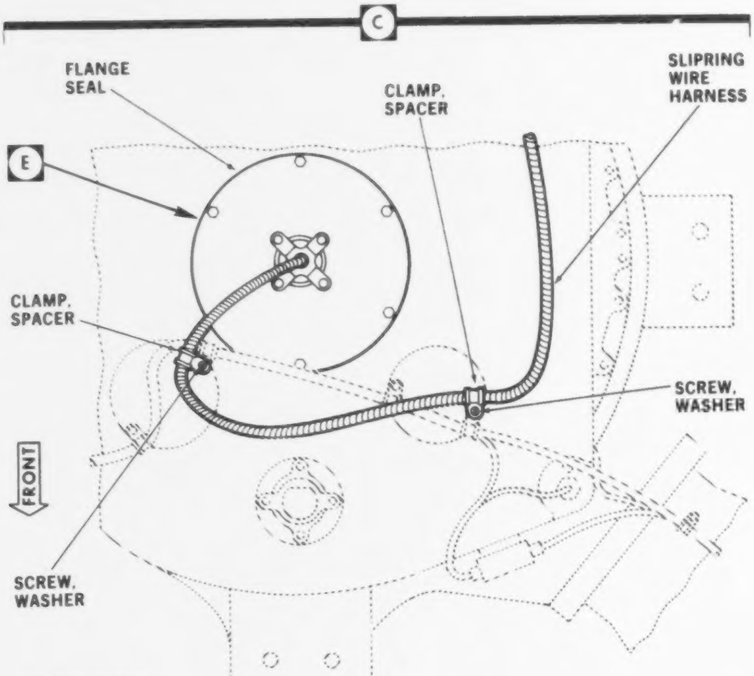

SCREW, WASHER
CLAMP BRACKET
FLANGE SEAL
GROMMET MS35489-13
SLIPRING WIRE HARNESS
CLAMP
CLAMP, SPACER
E
FRONT
C
D
SCREW, WASHER
D
BL 20
SCREW, WASHER, NUT
CLAMP
SLIPRING WIRE HARNESS

EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.

LOOKING UP AT BOTTOM OF MAIN GEAR BOX

EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.

RIGHT SIDE LOOKING TO FRONT STA 327


C
FLANGE SEAL
CLAMP, SPACER
SLIPRING WIRE HARNESS
E
CLAMP, SPACER
SCREW, WASHER
FRONT
SCREW, WASHER

EFFECTIVITY
UH-60L HELICOPTERS.

LOOKING UP AT BOTTOM OF MAIN GEAR BOX

UH60A-64660.2 (BH6)

FIGURE 12-55 (SHEET 2 OF 4)

12-6.3 REPLACE FLANGE SEAL AND PACKING 12-6.3

af. On UH-60A and EH-60A helicopters, install nuts and washers on two flange seal studs not used to install conduit and clamp brackets. Tighten nuts until snug for now.

af.1. On UH-60L helicopters, install flange seal using nuts and washers. **TORQUE NUTS TO 95 - 105 INCH-POUNDS.**

ag. Install packing, M83248/1-227, lubricated with lubricating oil, Item 221, Appendix D, on tube assembly.

ah. Place tube assembly into rotor shaft with anti-torque collar up.

ai. Turn tube assembly until ears on bottom of tube line up with slots on flange seal and press down until tube is seated.

aj. Install packing, M83248/1-126, lubricated with lubricating oil, Item 221, Appendix D, on rotor slipring assembly.

ak. Feed slipring wire harness through tube assembly. Have assistant in cabin pull wire harness through tube while distributor and slipring assembly are set in place.

al. Line up anti-rotation pin on slipring with slot on anti-torque collar of tube assembly.

am. Position distributor on bifilar with deice wire harnesses lined up with rotor blades.

an. Install distributor mounting bolts and washers, and deice wire harness clamps. **TORQUE ALL DISTRIBUTOR BOLTS TO 119 - 131 INCH-POUNDS.**

ao. Install deice wire harness on spindle brackets with screws, washers, nuts, and clamps.

ap. Connect electrical connectors, P841, P842, P843, and P844, to main rotor blades.

aq. Connect electrical connectors, P845, P846,P847, and P848, to droop stop heater pins.

ar. Slide slipring wire harness through grommet on conduit bracket.

as. On UH-60A and EH-60A helicopters, install conduit bracket as follows:

(1) Position conduit bracket on flange seal studs and secure with nuts and washers.

(2) Position clamp bracket on remaining flange seal studs and secure with nut and washer. **TORQUE ALL FLANGE SEAL NUTS TO 95 - 105 INCH-POUNDS.**

at. On UH-60L helicopters, position conduit bracket on flange seal and install with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

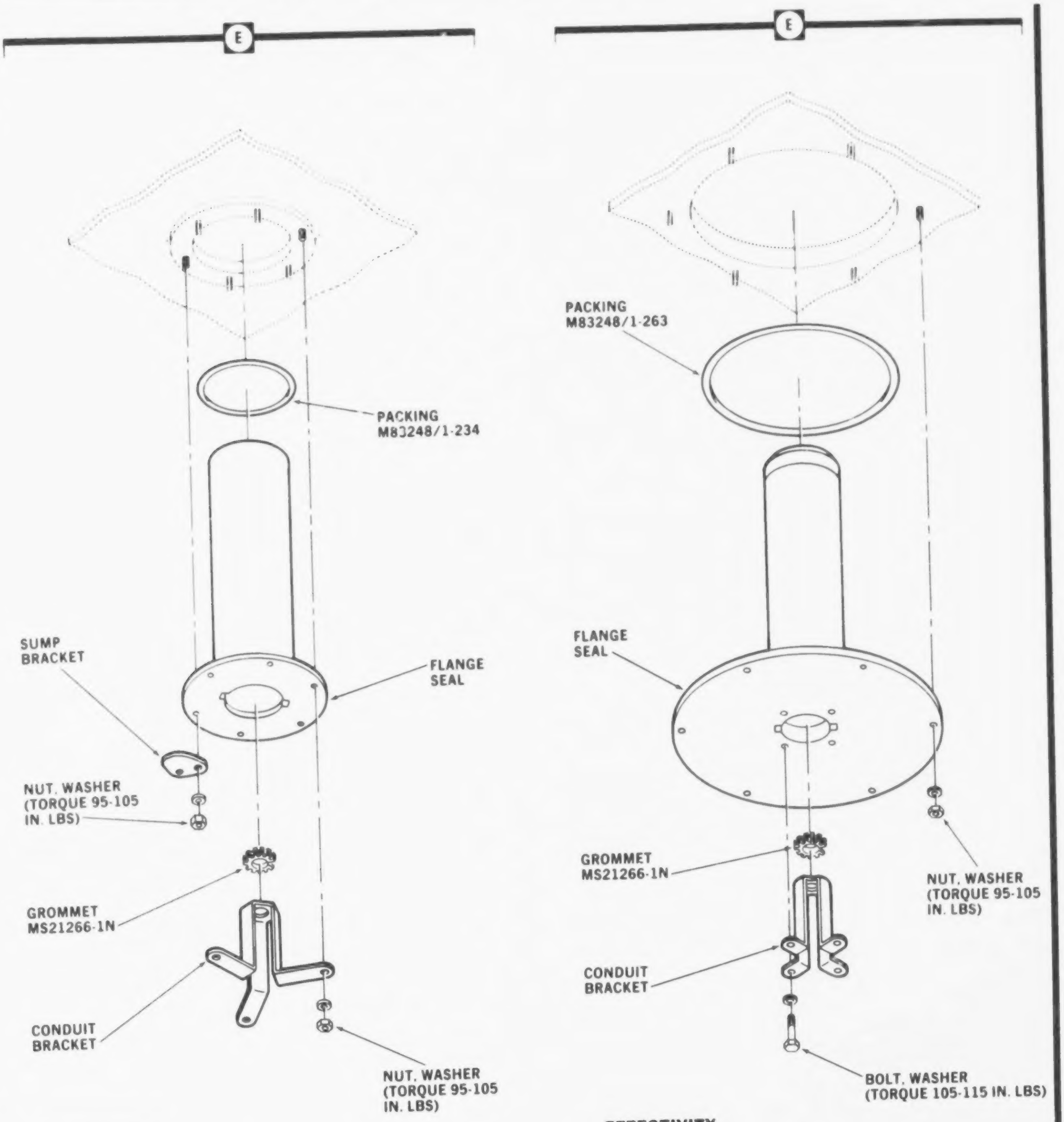
au. Seal hardware and flange seal edges with sealing compound, Item 312, Appendix D.

av. Install anti-chaff strip on slipring wire harness. Begin installation at conduit bracket grommet.

aw. Install slipring wire harness to clamp brackets with screws, washers, and clamps. Make sure clamps secure anti-chaff strip.

ax. Deleted.

12-6.3 REPLACE FLANGE SEAL AND PACKING 12-6.3


E
PACKING M83248/1-234
SUMP BRACKET
FLANGE SEAL
NUT, WASHER (TORQUE 95-105 IN. LBS)
GROMMET MS21266-1N
CONDUIT BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
E
PACKING M83248/1-263
FLANGE SEAL
GROMMET MS21266-1N
NUT, WASHER (TORQUE 95-105 IN. LBS)
CONDUIT BRACKET
BOLT, WASHER (TORQUE 105-115 IN. LBS)

EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.

EFFECTIVITY
UH-60L HELICOPTERS.

UH60A-64660.3 (BH6)

FIGURE 12-55 (SHEET 3 OF 4)

12-6.3 REPLACE FLANGE SEAL AND PACKING 12-6.3

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

ay. Clean sealing compound from wiring harness and grommet, MS35489-13, with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

az. Feed slipring wire harness through grommet at station 340, buttline 16.5 (right).

ba. Apply a bead of sealing compound, Item 312, Appendix D, around wiring harness, where it passes through grommet.

bb. Feed slipring wire harness through bulkhead at station 327, right buttline 20. Clamp harness to side of bulkhead with screw, washer, clamp, and nut.

bc. Unfasten and hang main junction box cover by chain.

bd. Carefully feed slipring harness wires through junction box grommet.

be. Using nuts and washers, connect wires to terminal board 3 of junction box as follows:

WIRE NO.	TERMINAL NO.
1-20-S2	1
1-10-A	2
1-20-S1	3
1-10-B	4
1-10-C	5

bf. Connect wires, H6395A20N, H6395B20N, and H6395C20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

bg. Install cover on junction box using cover fasteners.

bh. Clamp harness to stringer at station 326 with screw, washer, clamps, and nut.

bi. Install tiedown straps, Item 360, Appendix D, as required to secure parallel wire harness bundles.

bj. Service main transmission (PARA 1-4.1).

bk. Do an operational check of blade deicing system (TM 55-1520-237-T).

bl. Install main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

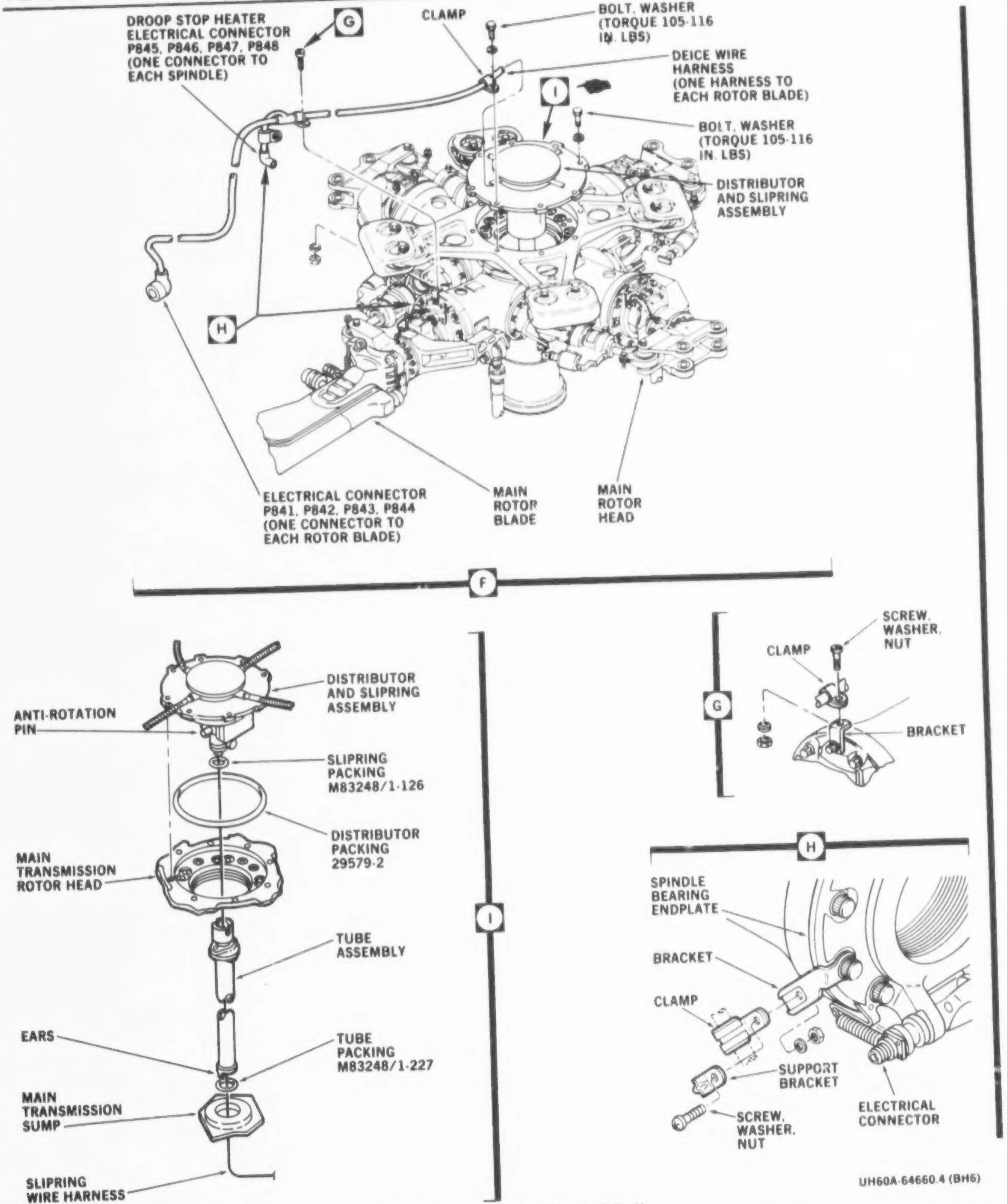

DROOP STOP HEATER ELECTRICAL CONNECTOR P845, P846, P847, P848 (ONE CONNECTOR TO EACH SPINDLE)
G
CLAMP
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DEICE WIRE HARNESS (ONE HARNESS TO EACH ROTOR BLADE)
I
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DISTRIBUTOR AND SLIPRING ASSEMBLY
H
ELECTRICAL CONNECTOR P841, P842, P843, P844 (ONE CONNECTOR TO EACH ROTOR BLADE)
MAIN ROTOR BLADE
MAIN ROTOR HEAD
F
DISTRIBUTOR AND SLIPRING ASSEMBLY
ANTI-ROTATION PIN
SLIPRING PACKING M83248/1-126
DISTRIBUTOR PACKING 29579-2
MAIN TRANSMISSION ROTOR HEAD
TUBE ASSEMBLY
EARS
TUBE PACKING M83248/1-227
MAIN TRANSMISSION SUMP
SLIPRING WIRE HARNESS
I
SCREW, WASHER, NUT
CLAMP
G
BRACKET
H
SPINDLE BEARING ENDPLATE
BRACKET
CLAMP
SUPPORT BRACKET
SCREW, WASHER, NUT
ELECTRICAL CONNECTOR
UH60A-64660.4 (BH6)

FIGURE 12-55 (SHEET 4 OF 4)

12-6.4 REPLACE TUBE ASSEMBLY AND PACKING 12-6.4

WARNING

Injury to personnel and damage to equipment will occur if main rotor head turns while maintenance is being performed on this area. Personnel or tools may come in contact with moving parts. Make sure gust lock is engaged before beginning maintenance on this area.

REMOVE

a. Turn off all electrical power.

b. Remove main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

c. Disconnect ground wires, H6395A20N, H6395B20N, and H6395C20N, located next to main junction box, from airframe ground.

d. Unfasten and hang main junction box cover by chain.

e. Disconnect slipring harness wires from junction box terminal board, No. 3, and pull wires out through grommet.

f. Remove wire harness clamps, as required, to free harness.

g. Remove anti-chaff strip from wire harness.

h. Pull harness through clamps and grommet until it hangs down from conduit bracket at flange seal. Cut harness tiedown straps as required to free harness.

i. On UH-60A and EH-60A helicopters, remove conduit bracket as follows:

  (1) Mark flange seal studs used to mount conduit and clamp brackets.

  (2) Remove nuts mounting conduit bracket to flange seal. Do not remove remaining flange seal mounting nuts now.

i.1. On UH-60L helicopters, remove bolts mounting conduit bracket to flange seal.

j. Slide conduit bracket off slipring wire harness.

k. Disconnect electrical connectors, P841, P842, P843, and P844, from rotor blades.

l. Disconnect electrical connectors, P845, P846, P847, and P848, from droop stop heater pins.

m. Remove deice wire harness clamps from brackets at each rotor spindle.

n. Remove bolts mounting distributor to bifilar.

o. Carefully lift distributor and slipring assembly from rotor head. Have assistant in cabin feed slipring wire harness through tube assembly.

p. Remove and discard slipring packing.

12-6.4 REPLACE TUBE ASSEMBLY AND PACKING 12-6.4

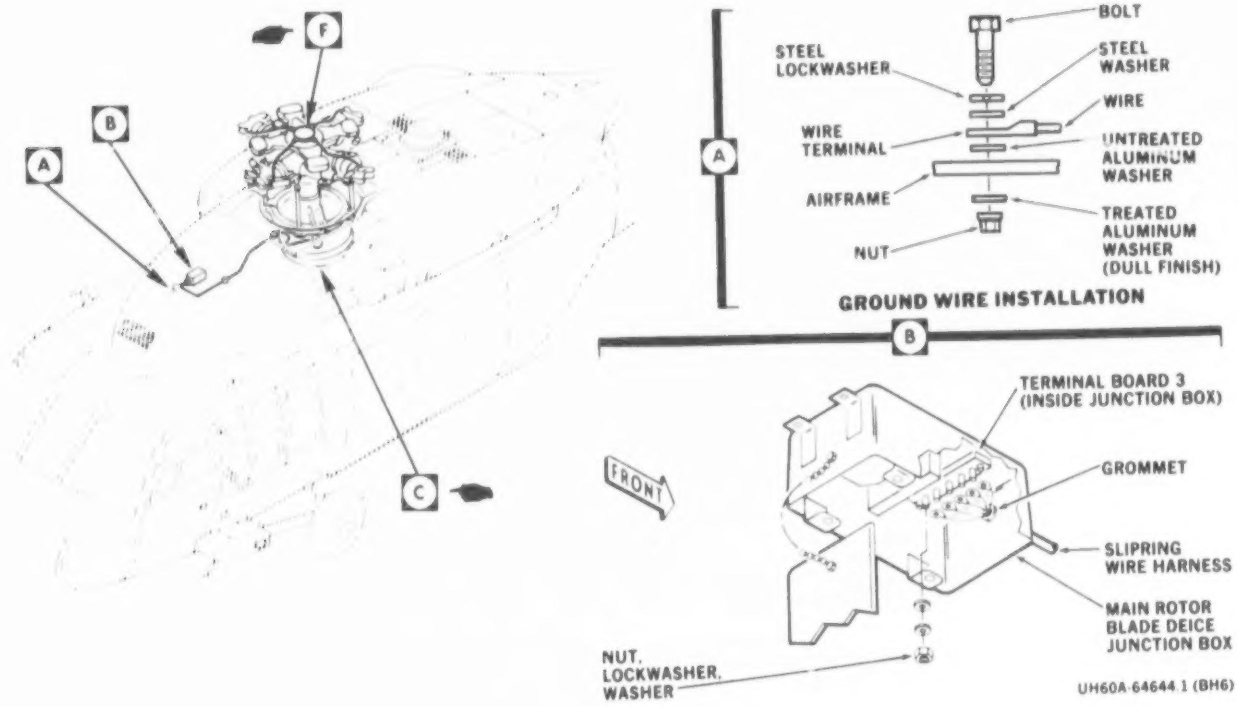

F
B
A
C
A
BOLT
STEEL LOCKWASHER
STEEL WASHER
WIRE
WIRE TERMINAL
UNTREATED ALUMINUM WASHER
AIRFRAME
TREATED ALUMINUM WASHER (DULL FINISH)
NUT
GROUND WIRE INSTALLATION
B
TERMINAL BOARD 3 (INSIDE JUNCTION BOX)
FRONT
GROMMET
SLIPRING WIRE HARNESS
MAIN ROTOR BLADE DEICE JUNCTION BOX
NUT, LOCKWASHER, WASHER
UH60A-64644.1 (BH6)

FIGURE 12-56 (SHEET 1 OF 4)

q. Set distributor and slipring assembly to one side. Be careful not to damage assembly.

r. Reach inside rotor shaft and remove tube assembly.

s. Remove and discard packing at bottom of tube assembly.

INSTALL

t. Turn off all electrical power.

u. Inspect distributor packing for cracks and/or decay. Replace packing, 29579-2, when cracks and/or decay are visible.

v. Check bifilar/distributor mating surfaces for cleanness.

w. Install packing, M83248/1-227, lubricated with lubricating oil, Item 221, Appendix D, on tube assembly.

x. Place tube assembly into rotor shaft with anti-torque collar up.

y. Turn tube assembly until ears on bottom of tube line up with slots on flange seal and press down until tube is seated.

z. Install packing, M83248/1-126, lubricated with lubricating oil, Item 221, Appendix D, on rotor slipring assembly.

aa. Line up anti-rotation pin on slipring with slot on anti-torque collar of tube assembly.

ab. Feed slipring wire harness through tube assembly. Have assistant in cabin pull wire harness through tube while distributor and slipring assembly are set in place on bifilar.

ac. Position distributor on bifilar with deice wire harnesses lined up with rotor blades.

12-6.4 REPLACE TUBE ASSEMBLY AND PACKING

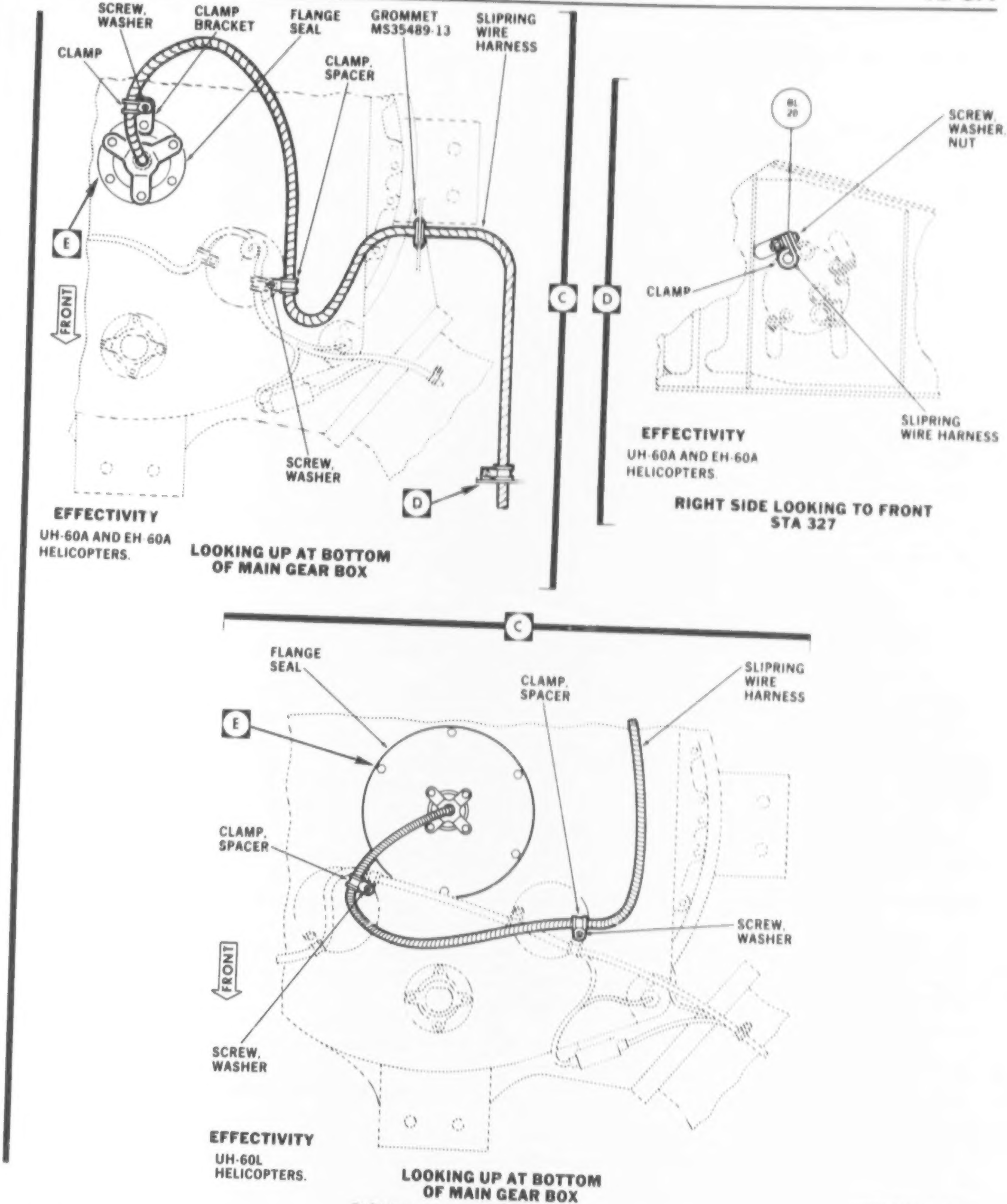

SCREW, WASHER
CLAMP BRACKET
FLANGE SEAL
GROMMET MS35489-13
SLIPRING WIRE HARNESS
CLAMP
CLAMP, SPACER
E
FRONT
SCREW, WASHER
D
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
LOOKING UP AT BOTTOM OF MAIN GEAR BOX
C
D
BL 20
SCREW, WASHER, NUT
CLAMP
SLIPRING WIRE HARNESS
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
RIGHT SIDE LOOKING TO FRONT STA 327
C
FLANGE SEAL
CLAMP, SPACER
SLIPRING WIRE HARNESS
E
CLAMP, SPACER
SCREW, WASHER
FRONT
SCREW, WASHER
EFFECTIVITY
UH-60L HELICOPTERS.
LOOKING UP AT BOTTOM OF MAIN GEAR BOX

FIGURE 12-56 (SHEET 2 OF 4)

UH60A-64644.2 (BH6)

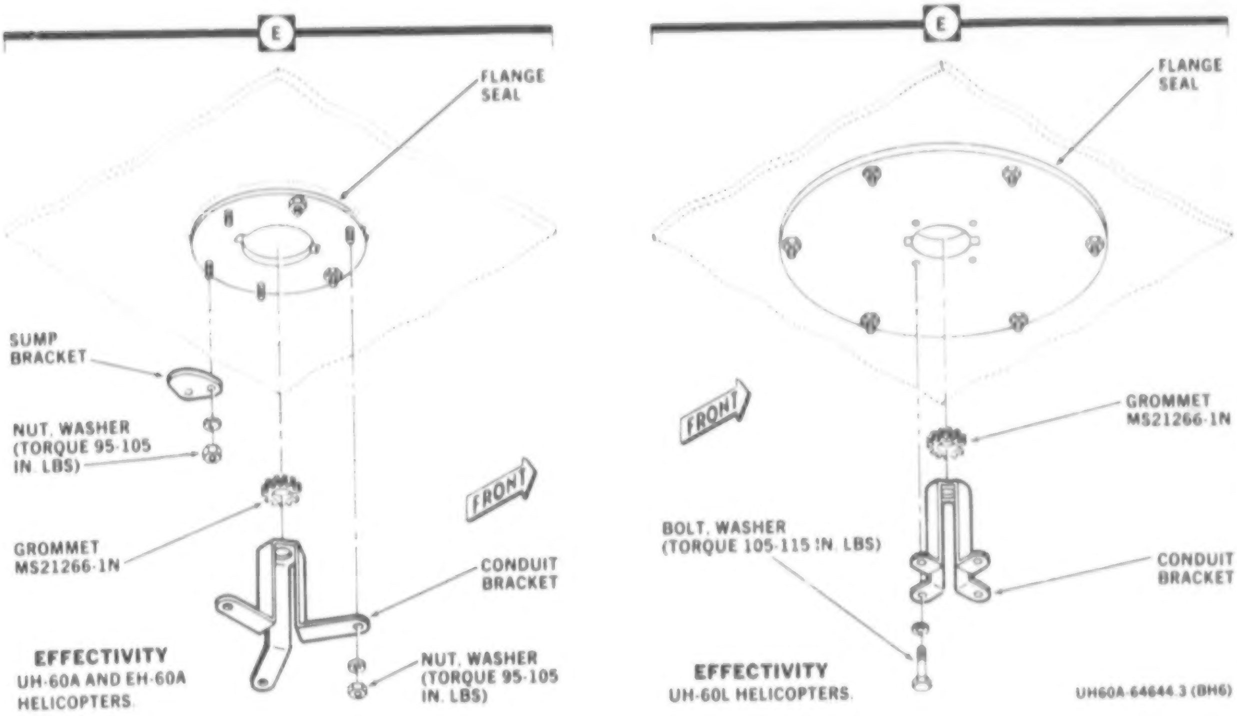

E
FLANGE SEAL
SUMP BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
GROMMET MS21266-1N
FRONT
CONDUIT BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
E
FLANGE SEAL
FRONT
GROMMET MS21266-1N
BOLT, WASHER (TORQUE 105-115 IN. LBS)
CONDUIT BRACKET
EFFECTIVITY
UH-60L HELICOPTERS.
UH60A-64644.3 (BH6)

FIGURE 12-56 (SHEET 3 OF 4)

ad. Install distributor mounting bolts and washers, and deice wire harness clamps. **TORQUE ALL DISTRIBUTOR BOLTS TO 119 - 131 INCH-POUNDS.**

ae. Install deice wire harness on spindle brackets with screws, washers, clamps, and nuts.

af. Connect electrical connectors, P841, P842, P843, and P844, to main rotor blades.

ag. Connect electrical connectors, P845, P846, P847, and P848, to droop stop heater pins.

ah. Slide slipring wire harness through grommet, MS35489-13, on conduit bracket.

ai. On UH-60A and EH-60A helicopters, position conduit bracket on flange seal studs and secure with nuts and washers. **TORQUE ALL FLANGE SEAL NUTS TO 95 - 105 INCH-POUNDS.**

ai.1. On UH-60L helicopters, position conduit bracket on flange seal and install with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

aj. Apply sealing compound, Item 312, Appendix D, around flange seal hardware.

ak. Install anti-chaff strip on slipring wire harness. Begin installation at conduit bracket grommet.

al. Install slipring wire harness to clamp brackets with screws, washers, and clamps. Make sure clamps secure anti-chaff strip and that wire harness is centered within flange seal.

12-6.4 REPLACE TUBE ASSEMBLY AND PACKING 12-6.4

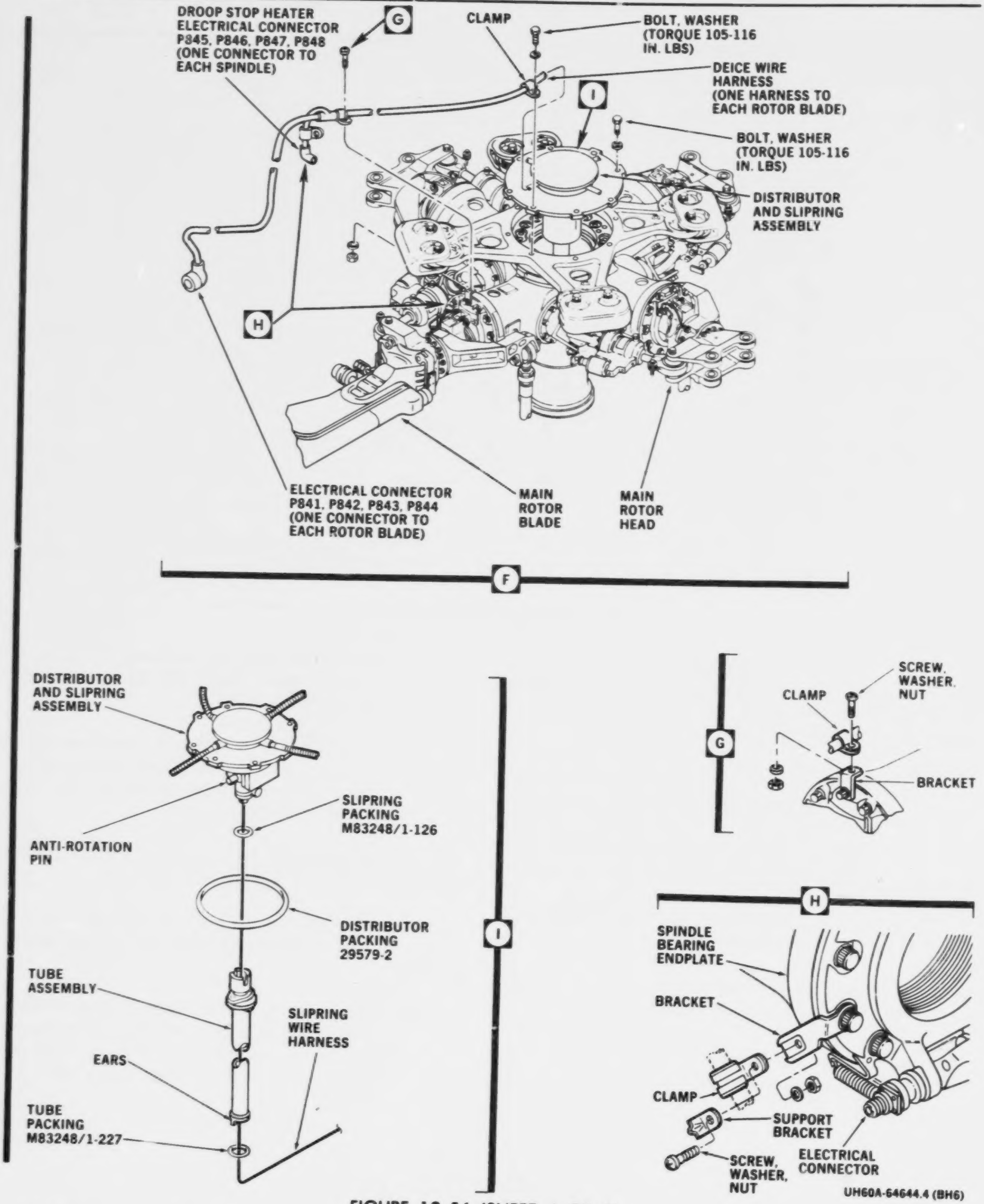

DROOP STOP HEATER ELECTRICAL CONNECTOR P845, P846, P847, P848 (ONE CONNECTOR TO EACH SPINDLE)
G
CLAMP
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DEICE WIRE HARNESS (ONE HARNESS TO EACH ROTOR BLADE)
I
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DISTRIBUTOR AND SLIPRING ASSEMBLY
H
ELECTRICAL CONNECTOR P841, P842, P843, P844 (ONE CONNECTOR TO EACH ROTOR BLADE)
MAIN ROTOR BLADE
MAIN ROTOR HEAD
F
DISTRIBUTOR AND SLIPRING ASSEMBLY
ANTI-ROTATION PIN
SLIPRING PACKING M83248/1-126
DISTRIBUTOR PACKING 29579-2
TUBE ASSEMBLY
SLIPRING WIRE HARNESS
EARS
TUBE PACKING M83248/1-227
I
G
CLAMP
SCREW, WASHER, NUT
BRACKET
H
SPINDLE BEARING ENDPLATE
BRACKET
CLAMP
SUPPORT BRACKET
SCREW, WASHER, NUT
ELECTRICAL CONNECTOR
UH60A-64644.4 (BH6)

FIGURE 12-56 (SHEET 4 OF 4)

12-6.4 REPLACE TUBE ASSEMBLY AND PACKING 12-6.4

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

am. Clean sealing compound from wiring harness and grommet, MS35489-13, with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

am.1. Feed slipring harness through grommet.

an. Apply a bead of sealing compound, Item 312, Appendix D, around wiring harness, where is passes through grommet.

ao. Feed slipring wire harness through bulkhead. Clamp harness to side of bulkhead with screw, washer, clamp, and nut.

ap. Unfasten and hang main junction box cover by chain.

aq. Carefully feed slipring harness wires through grommet, MS35489-13, in main junction box.

ar. Using nuts and washers, connect wires to terminal board, No. 3, of junction box as follows:

WIRE NO.	TERMINAL NO.
1-20-S2	1
1-10-A	2
1-20-S1	3
1-10-B	4
1-10-C	5

as. Connect wires, No. H6395A20N, No. H6395B20N, and No. H6395C20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

at. Install cover on main junction box.

au. Install tiedown straps, Item 360, Appendix D, as required to secure wire harness bundles.

av. Clamp harness to stringer at station 326 with screw, washer, clamp, and nut.

aw. Do an operational check of blade deicing system (TM 55-1520-237-T).

ax. Install main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

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12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5

WARNING

Injury to personnel and damage to equipment will occur if main rotor head turns while maintenance is being performed on this area. Personnel or tools may come in contact with moving parts. Make sure gust lock is engaged before beginning maintenance on this area.

REMOVE

a. Turn off all electrical power.

b. Remove drip pan from cabin ceiling (PARA 2-34, PARA 2-35, or PARA 2-36).

c. Disconnect ground wires, H6395A20N, H6395B20N and H6395C20N, next to main junction box, from airframe ground.

d. Unfasten and hang main junction box cover by chain.

e. Disconnect slipring harness wires from junction box terminal board, No. 3, and pull wires out through grommet.

f. Remove wire harness clamps, as required, to free harness.

g. Remove anti-chaff strip from wire harness.

h. Pull harness through clamps and grommet until it hangs down from conduit bracket at flange seal. Cut harness tiedown straps as required to free harness.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

i. Clean sealing compound from wiring harness and grommet with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

j. On UH-60A and EH-60A helicopters, remove conduit bracket as follows:

   (1) Mark flange seal nuts used to mount conduit and clamp brackets.

   (2) Remove nuts mounting conduit bracket to flange seal. Do not remove remaining flange seal mounting nuts now.

j.1. On UH-60L helicopters, remove bolts mounting conduit bracket to flange seal.

k. Slide conduit bracket off slipring wire harness.

l. Disconnect electrical connectors, P841, P842, P843, and P844, from rotor blades. Remove and discard packing.

m. Disconnect electrical connectors, P845, P846, P847, and P848, from droop stop heater pins.

n. Remove deice wire harness clamps from brackets at each rotor spindle.

o. Remove bolts mounting distributor to bifilar.

p. Carefully lift distributor and slipring assembly from rotor head. Have assistant in cabin feed slipring wire harness through tube assembly.

12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5

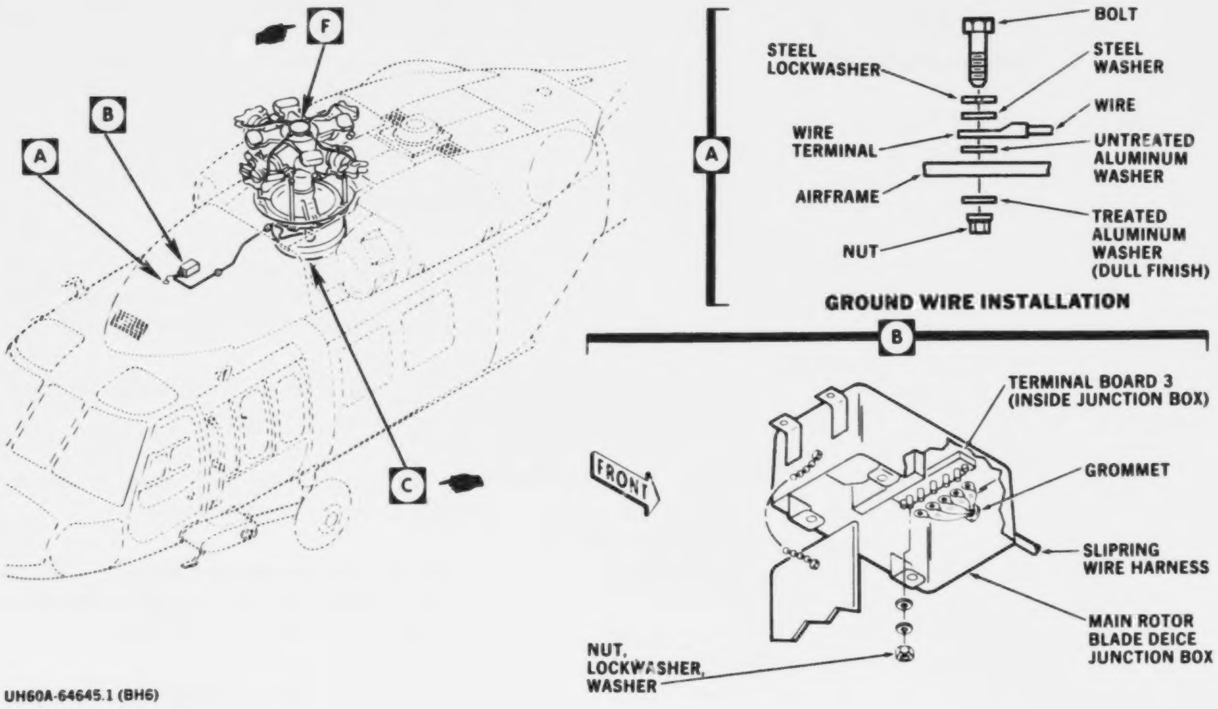

F
B
A
C
A
BOLT
STEEL LOCKWASHER
STEEL WASHER
WIRE
WIRE TERMINAL
UNTREATED ALUMINUM WASHER
AIRFRAME
NUT
TREATED ALUMINUM WASHER (DULL FINISH)
GROUND WIRE INSTALLATION
B
TERMINAL BOARD 3 (INSIDE JUNCTION BOX)
FRONT
GROMMET
SLIPRING WIRE HARNESS
MAIN ROTOR BLADE DEICE JUNCTION BOX
NUT, LOCKWASHER, WASHER
UH60A-64645.1 (BH6)

FIGURE 12-57 (SHEET 1 OF 4)

q. Loosen nuts on distributor terminal board to disconnect slipring terminal lugs.

r. Remove slipring mounting bolts and separate slipring from distributor.

s. Reach inside rotor shaft and remove tube assembly.

t. Remove and discard packing at bottom of tube assembly.

u. Inspect tube assembly anti-torque coupling for loose bolts and bent or cracked flexible disc. Replace tube assembly when worn or damaged.

v. Install packing, M83248/1-227, lubricated with lubricating oil, Item 221, Appendix D, on tube assembly.

w. Place tube assembly into rotor shaft with anti-torque collar up.

x. Turn tube assembly until ears on bottom of tube line up with slots on flange seal and press down until tube is seated.

INSTALL

y. Turn off all electrical power.

z. Inspect distributor packing for cracks and/or decay. Replace packing, 29579-2, when cracks and/or decay are visible.

aa. Check bifilar/distributor mating surfaces for cleanness.

12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5

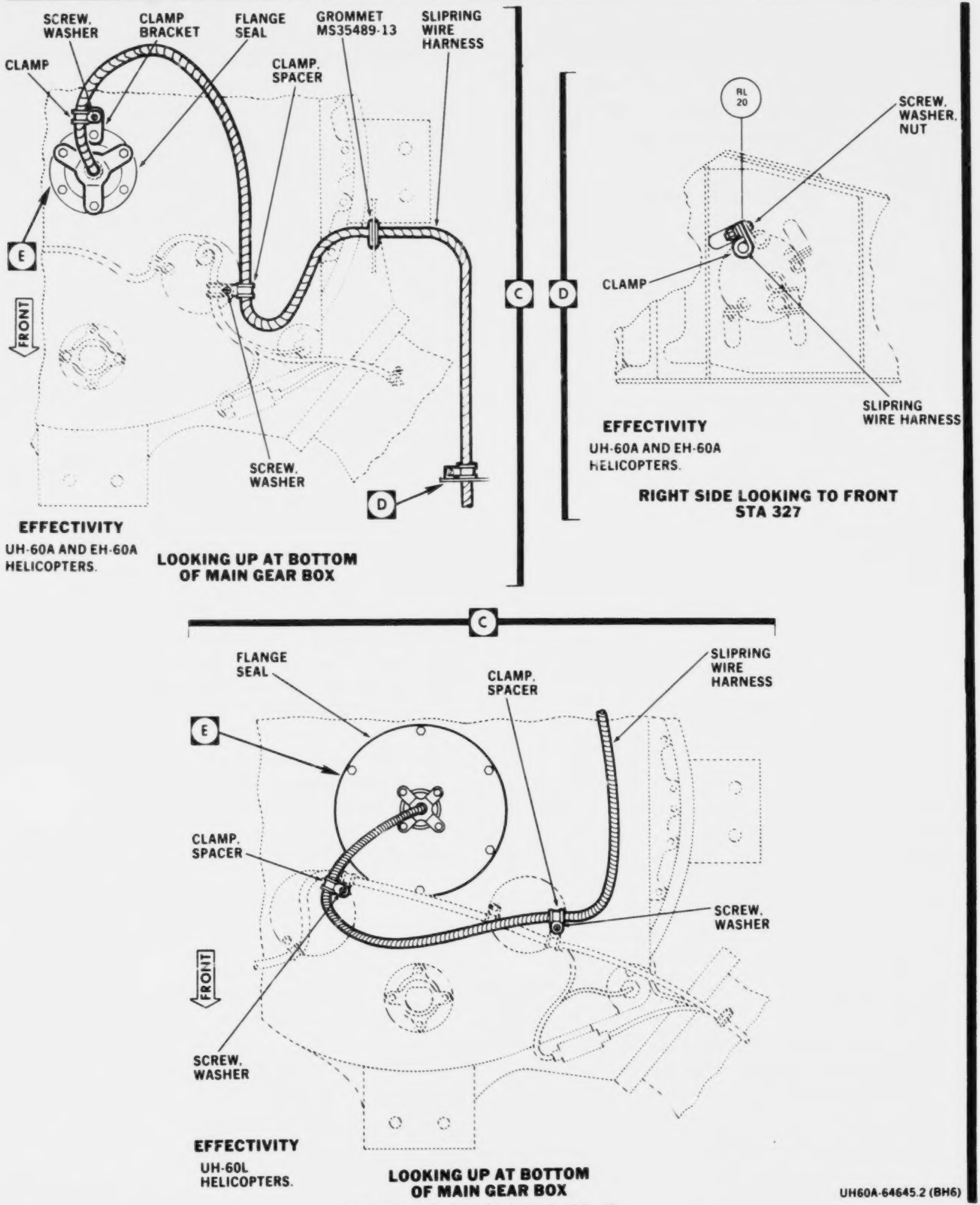

SCREW, WASHER
CLAMP BRACKET
FLANGE SEAL
GROMMET MS35489-13
SLIPRING WIRE HARNESS
CLAMP
CLAMP, SPACER
E
FRONT
C
D
SCREW, WASHER
D
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
LOOKING UP AT BOTTOM OF MAIN GEAR BOX
RL 20
SCREW, WASHER, NUT
CLAMP
SLIPRING WIRE HARNESS
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
RIGHT SIDE LOOKING TO FRONT STA 327
C
FLANGE SEAL
SLIPRING WIRE HARNESS
CLAMP, SPACER
E
CLAMP, SPACER
SCREW, WASHER
FRONT
SCREW, WASHER
EFFECTIVITY
UH-60L HELICOPTERS.
LOOKING UP AT BOTTOM OF MAIN GEAR BOX
UH60A-64645.2 (BH6)

FIGURE 12-57 (SHEET 2 OF 4)

12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5

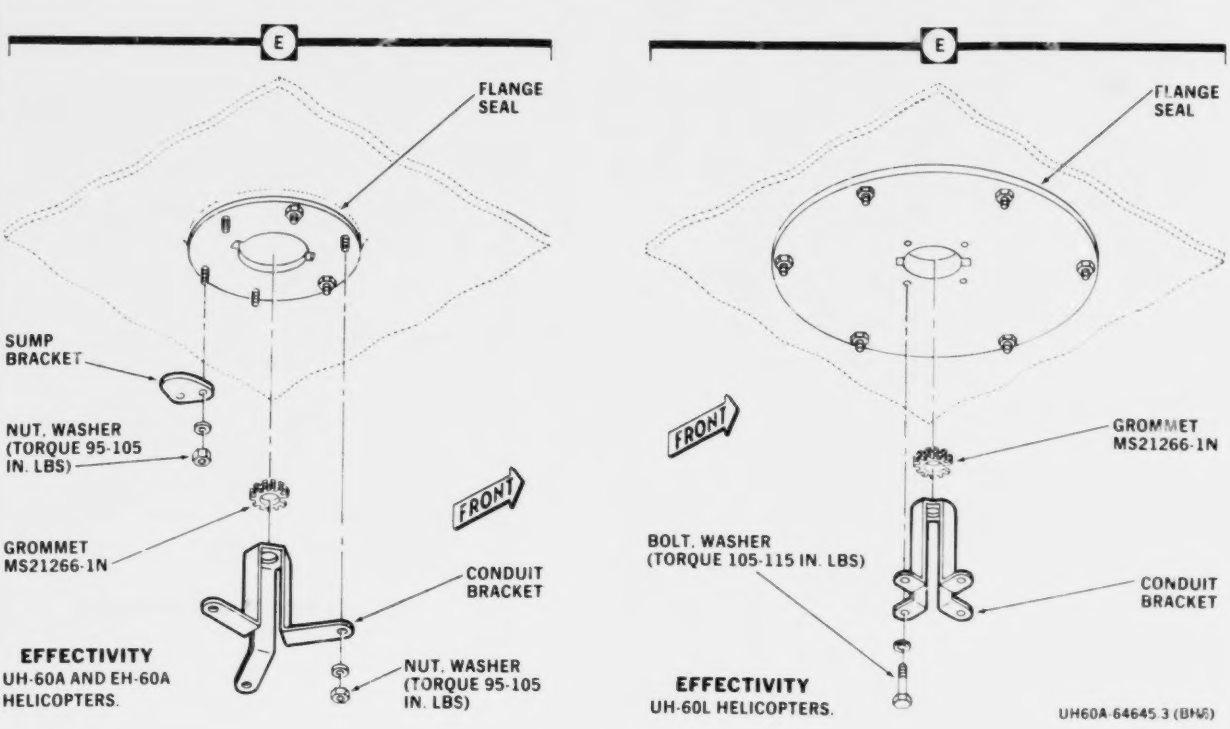

E
FLANGE SEAL
SUMP BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
GROMMET MS21266-1N
FRONT
CONDUIT BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
E
FLANGE SEAL
FRONT
GROMMET MS21266-1N
BOLT, WASHER (TORQUE 105-115 IN. LBS)
CONDUIT BRACKET
EFFECTIVITY
UH-60L HELICOPTERS.
UH60A-64645 3 (BH6)

FIGURE 12-57 (SHEET 3 OF 4)

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

ab. Clean slipring and distributor mounting surfaces with methyl ethyl ketone, Item 233, Appendix D.

ac. Mount slipring to distributor using bolts and washers. **TORQUE ALL BOLTS TO 47 - 53 INCH-POUNDS.**

ad. Tighten distributer terminal board nuts to secure slipring flexible terminal lugs to distributor terminal board.

ae. Install packing, M83248/1-126, lubricated with lubricating oil, Item 221, Appendix D, on rotor slipring assembly.

af. Feed slipring wire harness through tube assembly. Have assistant in cabin pull wire harness through tube while distributor and slipring assembly are set in place on bifilar.

ag. Line up anti-rotation pin on slipring with slot on anti-torque collar of tube assembly.

12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5

ah. Position distributor on bifilar with deice wire harnesses lined up with rotor blades.

ai. Install distributor mounting bolts and washers, and deice wire harness clamps. **TORQUE ALL DISTRIBUTOR BOLTS TO 105 - 116 INCH-POUNDS.**

aj. Install deice wire harness on spindle brackets with screws, washers, clamps, and nuts.

ak. Connect electrical connectors, P841, P842, P843, and P844, to main rotor blades.

al. Connect electrical connectors, P845, P846, P847, and P848, to droop stop heater pins.

am. Slide slipring wire harness through grommet on conduit bracket.

an. On UH-60A and EH-60A helicopters, position conduit bracket on flange seal studs and secure with nuts and washers. **TORQUE ALL FLANGE SEAL NUTS TO 95 - 105 INCH-POUNDS.**

an.1. On UH-60L helicopters, position conduit bracket on flange seal and secure with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

ao. Apply sealing compound, Item 312, Appendix D, around flange seal hardware.

ap. Install anti-chaff strip on slipring wire harness. Begin installation at conduit bracket grommet.

aq. Install slipring wire harness to clamp brackets with screws, washers, and clamps. Make sure clamps secure anti-chaff strip and that wire harness is centered within flange seal.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

ar. Clean sealing compound from wiring harness and grommet, MS35489-13, with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

as. Feed slipring wire harness through grommet at station 340, buttline 16.5 (right).

at. Apply a bead of sealing compound, Item 312, Appendix D, around wiring harness, where it passes through grommet, MS35489-13.

au. Feed slipring wire harness through bulkhead at station 327, buttline 20 (right). Clamp harness to side of bulkhead with screw, washer, clamp, and nut.

12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5

av. Unfasten and hang main junction box cover by chain.

aw. Carefully feed slipring harness wires through grommet in main junction box.

ax. Using nuts and washers, connect wires to terminal board, No. 3, of junction box as follows:

WIRE NO.	TERMINAL NO.
1-20-S2	1
1-10-A	2
1-20-S1	3
1-10-B	4
1-10-C	5

ay. Connect wires, No. H6395A20N, No. H6395B20N, and No. H6395C20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

az. Install cover on main junction box.

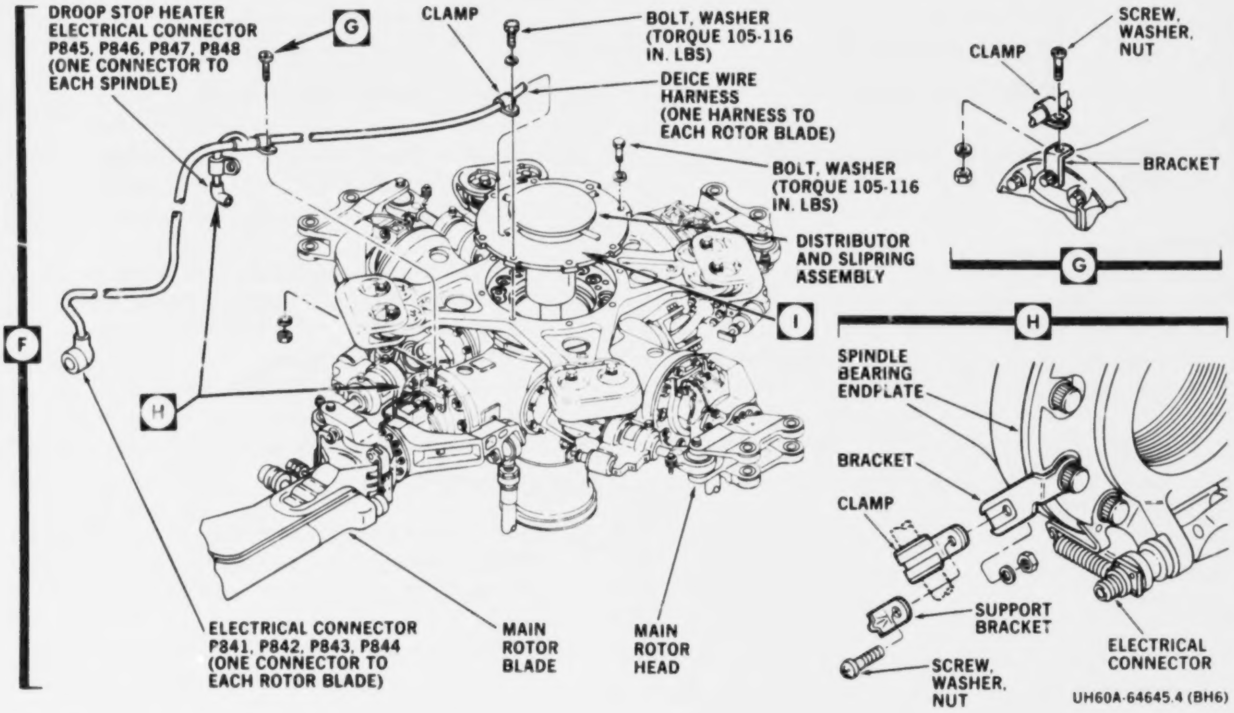
ba. Install tiedown straps, Item 360, Appendix D, as required to secure wire harness bundles.

bb. Clamp harness to stringer at station 326 with screw, washer, clamp, and nut.

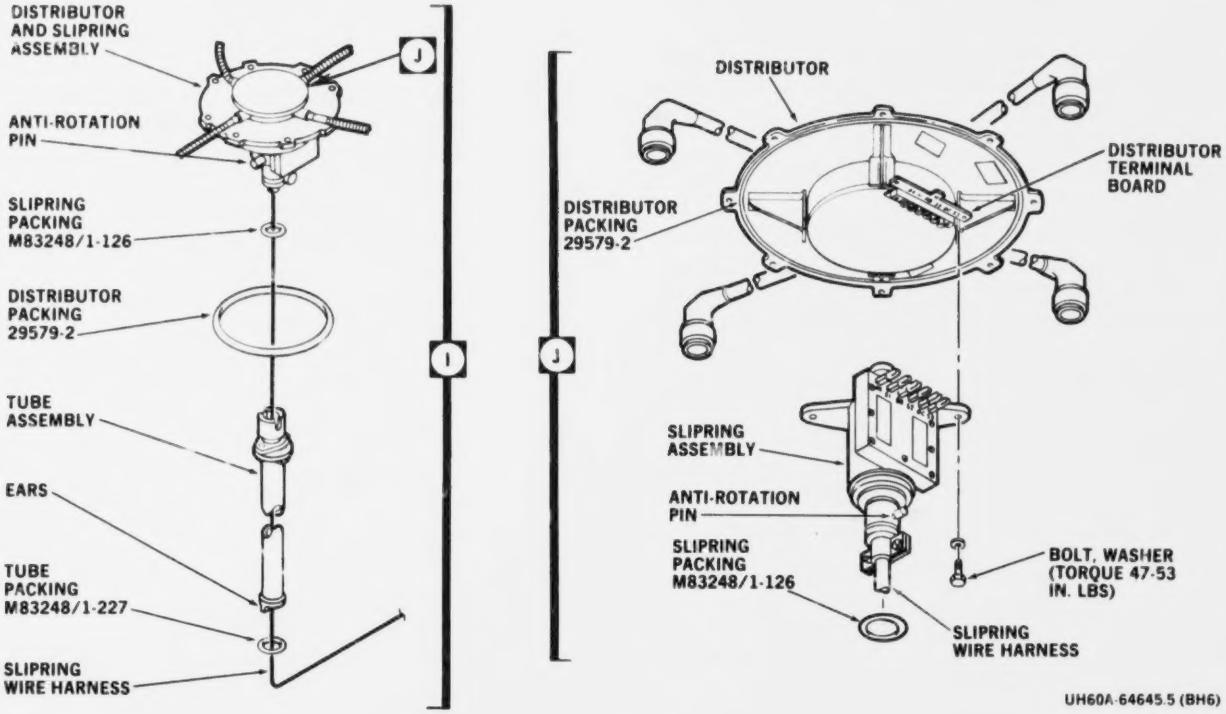
bc. Do an operational check of blade deicing system (TM 55-1520-237-T).

bd. Install main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

12-6.5 REPLACE MAIN ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.5


DROOP STOP HEATER ELECTRICAL CONNECTOR P845, P846, P847, P848 (ONE CONNECTOR TO EACH SPINDLE)
G
CLAMP
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DEICE WIRE HARNESS (ONE HARNESS TO EACH ROTOR BLADE)
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DISTRIBUTOR AND SLIPRING ASSEMBLY
I
F
H
ELECTRICAL CONNECTOR P841, P842, P843, P844 (ONE CONNECTOR TO EACH ROTOR BLADE)
MAIN ROTOR BLADE
MAIN ROTOR HEAD
CLAMP
SCREW, WASHER, NUT
BRACKET
G
H
SPINDLE BEARING ENDPLATE
BRACKET
CLAMP
SUPPORT BRACKET
ELECTRICAL CONNECTOR
SCREW, WASHER, NUT

UH60A-64645.4 (BH6)


DISTRIBUTOR AND SLIPRING ASSEMBLY
J
ANTI-ROTATION PIN
SLIPRING PACKING M83248/1-126
DISTRIBUTOR PACKING 29579-2
TUBE ASSEMBLY
EARS
TUBE PACKING M83248/1-227
SLIPRING WIRE HARNESS
I
J
DISTRIBUTOR
DISTRIBUTOR TERMINAL BOARD
DISTRIBUTOR PACKING 29579-2
SLIPRING ASSEMBLY
ANTI-ROTATION PIN
SLIPRING PACKING M83248/1-126
BOLT, WASHER (TORQUE 47-53 IN. LBS)
SLIPRING WIRE HARNESS

UH60A-64645.5 (BH6)

FIGURE 12-57 (SHEET 4 OF 4)

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6

WARNING

Make certain rotor blade gust lock is engaged.

REMOVE

a. Turn off all electrical power.

b. Remove main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

c. Disconnect ground wires, H6395A20N, H6395B20N and H6395C20N, next to main junction box, from airframe ground.

d. Unfasten and hang main junction box cover by chain.

e. Disconnect slipring harness wires from junction box terminal board, No. 3, and pull wires out through grommet.

f. Remove screw from slipring wire harness clamp at flange seal, transmission sump, station 326, and station 327.

g. Remove anti-chaff strip from wire harness.

h. Pull harness through clamps and grommet until it hangs down from conduit bracket at flange seal. Cut harness tiedown straps as required to free harness.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

i. Clean sealing compound from wiring harness and grommet with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

j. Remove nuts mounting conduit bracket to flange seal. Do not remove remaining flange seal mounting nuts.

k. Slide conduit bracket off slipring wire harness.

l. Disconnect electrical connectors, P841, P842, P843, and P844, from rotor blades. Remove and discard packing.

m. Disconnect electrical connectors, P845, P846, P847, and P848, from droop stop heater pins.

n. Remove deice wire harness clamps from brackets at each rotor spindle.

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6

o. Remove bolts mounting distributor to bifilar.

p. Carefully lift distributor and slipring assembly from rotor head. Have assistant in cabin feed slipring wire harness through tube assembly.

q. Remove and discard slipring packing.

r. Loosen nuts on distributor terminal board to disconnect slipring terminal lugs.

s. Remove slipring mounting bolts and separate slipring from distributor.

t. Remove screws from slipring brush assembly and carefully separate brush assembly from slipring housing.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

u. Clean slipring housing and stator with methyl ethyl ketone, Item 233, Appendix D.

v. Reach inside rotor shaft and remove tube assembly.

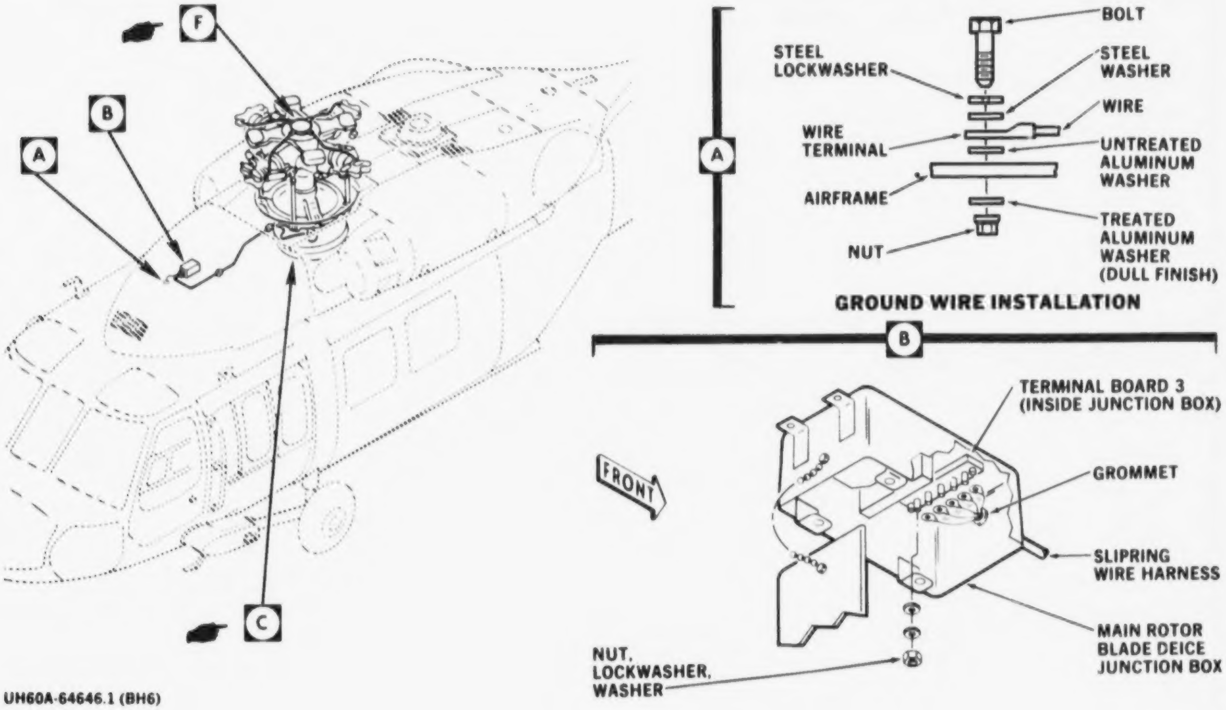
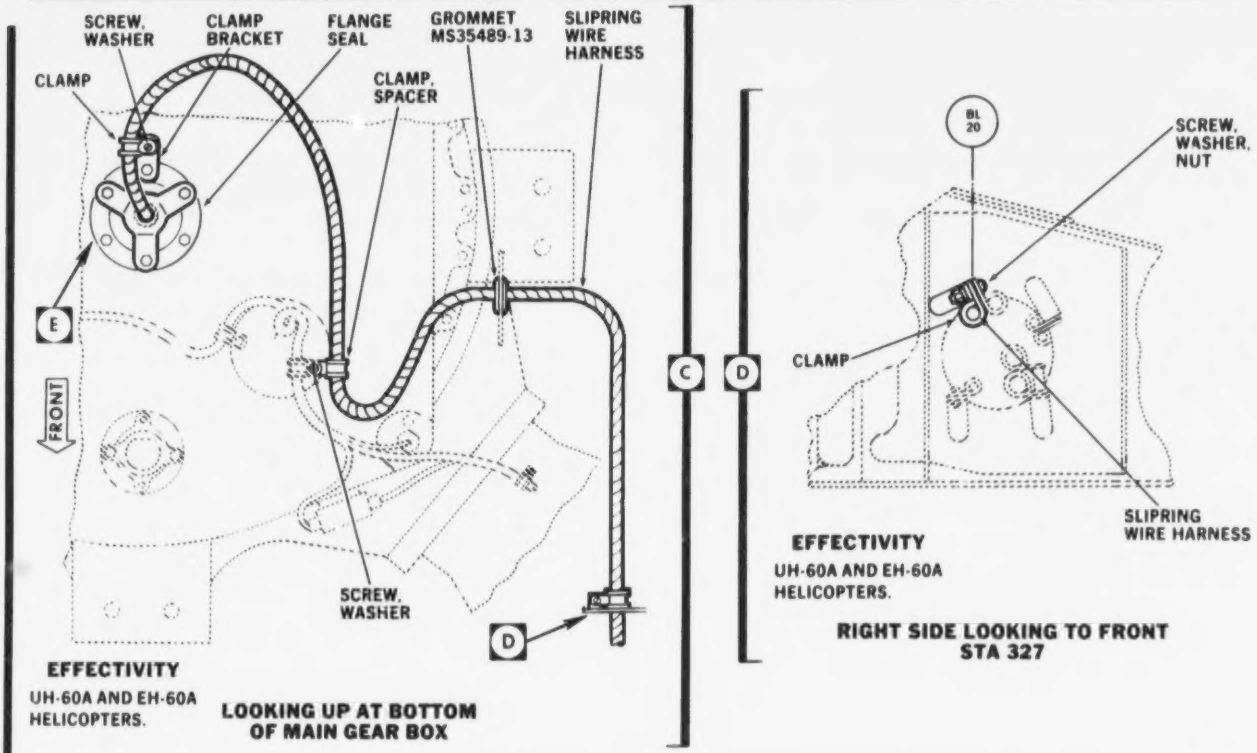

F
B
A
C
A
BOLT
STEEL LOCKWASHER
STEEL WASHER
WIRE
WIRE TERMINAL
UNTREATED ALUMINUM WASHER
AIRFRAME
TREATED ALUMINUM WASHER (DULL FINISH)
NUT
GROUND WIRE INSTALLATION
B
TERMINAL BOARD 3 (INSIDE JUNCTION BOX)
FRONT
GROMMET
SLIPRING WIRE HARNESS
MAIN ROTOR BLADE DEICE JUNCTION BOX
NUT, LOCKWASHER, WASHER
UH60A-64646.1 (BH6)

FIGURE 12-58 (SHEET 1 OF 4)

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6


SCREW, WASHER
CLAMP BRACKET
FLANGE SEAL
GROMMET MS35489-13
SLIPRING WIRE HARNESS
CLAMP
CLAMP, SPACER
E
FRONT
SCREW, WASHER
D
C
D
BL 20
SCREW, WASHER, NUT
CLAMP
SLIPRING WIRE HARNESS

EFFECTIVITY

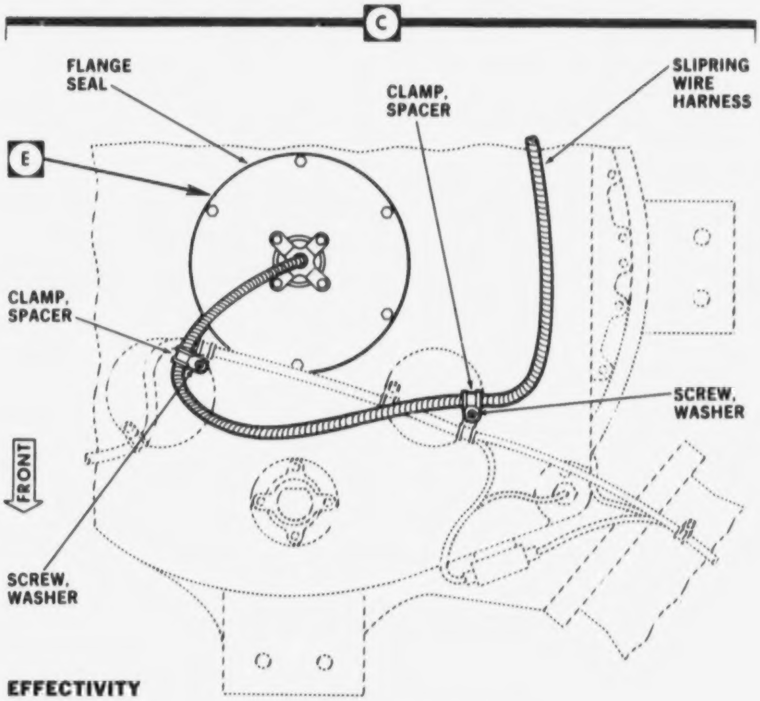
UH-60A AND EH-60A HELICOPTERS.

LOOKING UP AT BOTTOM OF MAIN GEAR BOX

EFFECTIVITY

UH-60A AND EH-60A HELICOPTERS.

RIGHT SIDE LOOKING TO FRONT STA 327


C
FLANGE SEAL
SLIPRING WIRE HARNESS
CLAMP, SPACER
E
CLAMP, SPACER
SCREW, WASHER
FRONT
SCREW, WASHER

EFFECTIVITY

UH-60L HELICOPTERS.

LOOKING UP AT BOTTOM OF MAIN GEAR BOX

UH60A-64646.4 (BH6)

FIGURE 12-58 (SHEET 2 OF 4)

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6

w. Remove and discard packing at bottom of tube assembly.

x. Inspect tube assembly anti-torque coupling for loose bolts and bent or cracked flexible disc. Replace tube assembly when worn or damaged.

y. Install packing, M83248/1-227, lubricated with lubricating oil, Item 221, Appendix D, on tube assembly.

z. Place tube assembly into rotor shaft with anti-torque collar up.

aa. Turn tube assembly until ears on bottom of tube line up with slots on flange seal and press down until tube is seated.

INSTALL

ab. Turn off all electrical power.

ac. Inspect distributor packing for cracks and/or decay. Replace packing, 29579-2 when cracks and/or decay are visible.

ad. Carefully install brush assembly on slipring housing with screws and lockwashers.

ae. Clean slipring and distributor mounting surfaces with methyl ethyl ketone, Item 233, Appendix D.

af. Mount slipring to distributor using bolts and washers. **TORQUE ALL BOLTS TO 47 - 53 INCH-POUNDS.**

ag. Tighten distributor terminal board nuts to secure flexible terminal lugs to distributor.

ah. Install packing, M83248/1-126, lubricated with lubricating oil, Item 221, Appendix D, on rotor slipring assembly.

ai. Check bifilar/distributor mating surfaces for cleanness.

aj. Feed slipring wire harness through tube assembly. Have assistant in cabin pull wire harness through tube while distributor and slipring assembly are set in place on bifilar.

ak. Line up anti-rotation pin on slipring with slot on anti-torque collar of tube assembly.

al. Position distributor on bifilar with deice wire harnesses lined up with rotor blades.

am. Install distributor mounting bolts and washers, and deice wire harness clamps. **TORQUE ALL DISTRIBUTOR BOLTS TO 119 - 131 INCH-POUNDS.**

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6

an. Install deice wire harness on spindle brackets with screws, washers, clamps, and nuts.

ao. Connect electrical connectors, P841, P842, P843, and P844, to main rotor blades, using packing, MS9068-026.

ap. Connect electrical connectors, P845, P846, P847, and P848, to droop stop heater pins.

aq. Slide slipring wire harness through grommet on conduit bracket.

ar. On UH-60A and EH-60A helicopters, position conduit bracket on flange seal studs and secure with nuts and washers. **TORQUE ALL FLANGE SEAL NUTS TO 95 - 105 INCH-POUNDS.**

ar.1. On UH-60L helicopters, position conduit bracket on flange seal and secure with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

as. Apply sealing compound, Item 312, Appendix D, around flange seal hardware.

at. Install anti-chaff strip on slipring wire harness. Begin installation at conduit bracket grommet.

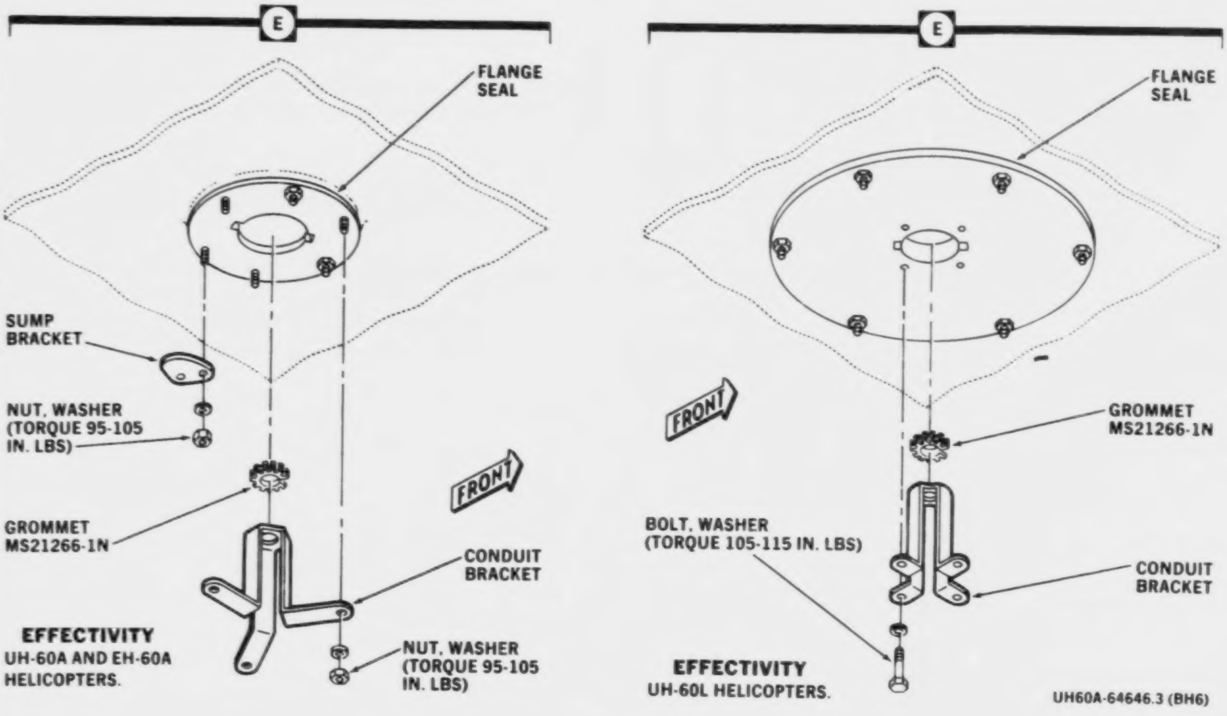
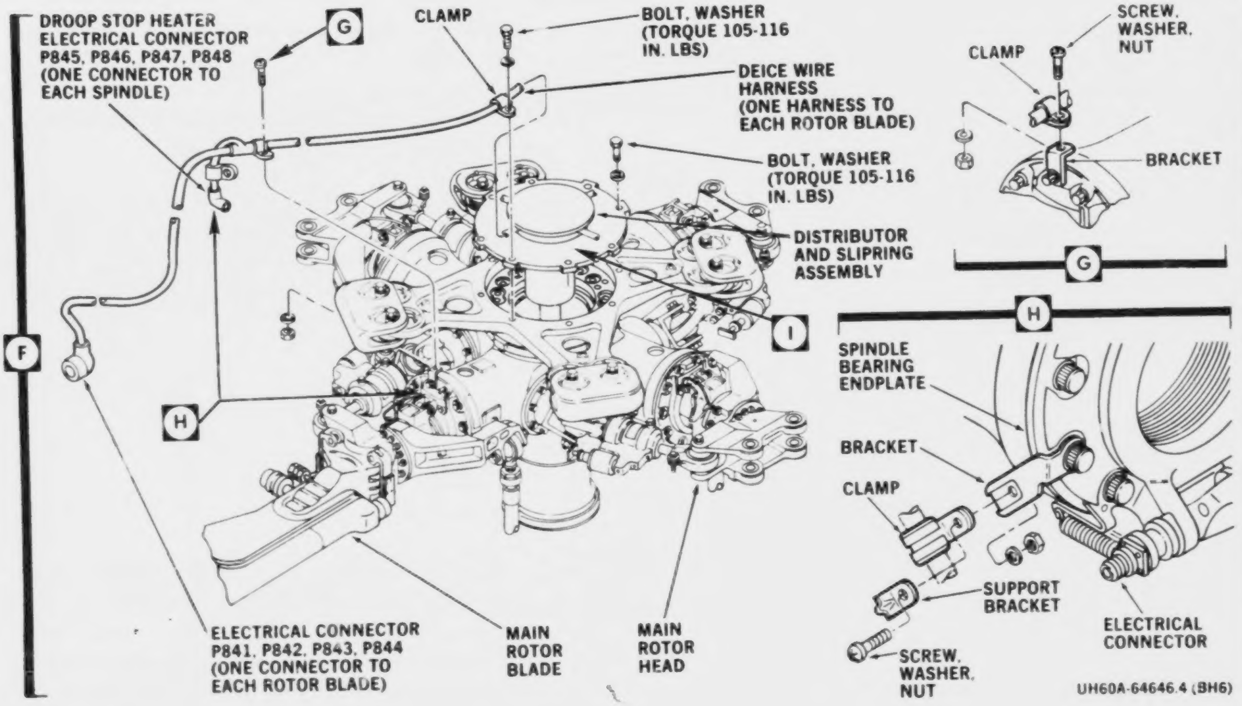

E
FLANGE SEAL
SUMP BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
GROMMET MS21266-1N
FRONT
CONDUIT BRACKET
NUT, WASHER (TORQUE 95-105 IN. LBS)
EFFECTIVITY
UH-60A AND EH-60A HELICOPTERS.
E
FLANGE SEAL
FRONT
GROMMET MS21266-1N
BOLT, WASHER (TORQUE 105-115 IN. LBS)
CONDUIT BRACKET
EFFECTIVITY
UH-60L HELICOPTERS.
UH60A-64646.3 (BH6)

FIGURE 12-58 (SHEET 3 OF 4)

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6


DROOP STOP HEATER ELECTRICAL CONNECTOR P845, P846, P847, P848 (ONE CONNECTOR TO EACH SPINDLE)
G
CLAMP
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DEICE WIRE HARNESS (ONE HARNESS TO EACH ROTOR BLADE)
BOLT, WASHER (TORQUE 105-116 IN. LBS)
DISTRIBUTOR AND SLIPRING ASSEMBLY
I
F
H
ELECTRICAL CONNECTOR P841, P842, P843, P844 (ONE CONNECTOR TO EACH ROTOR BLADE)
MAIN ROTOR BLADE
MAIN ROTOR HEAD
CLAMP
SCREW, WASHER, NUT
BRACKET
G
H
SPINDLE BEARING ENDPLATE
BRACKET
CLAMP
SUPPORT BRACKET
ELECTRICAL CONNECTOR
SCREW, WASHER, NUT
UH60A-64646.4 (BH6)

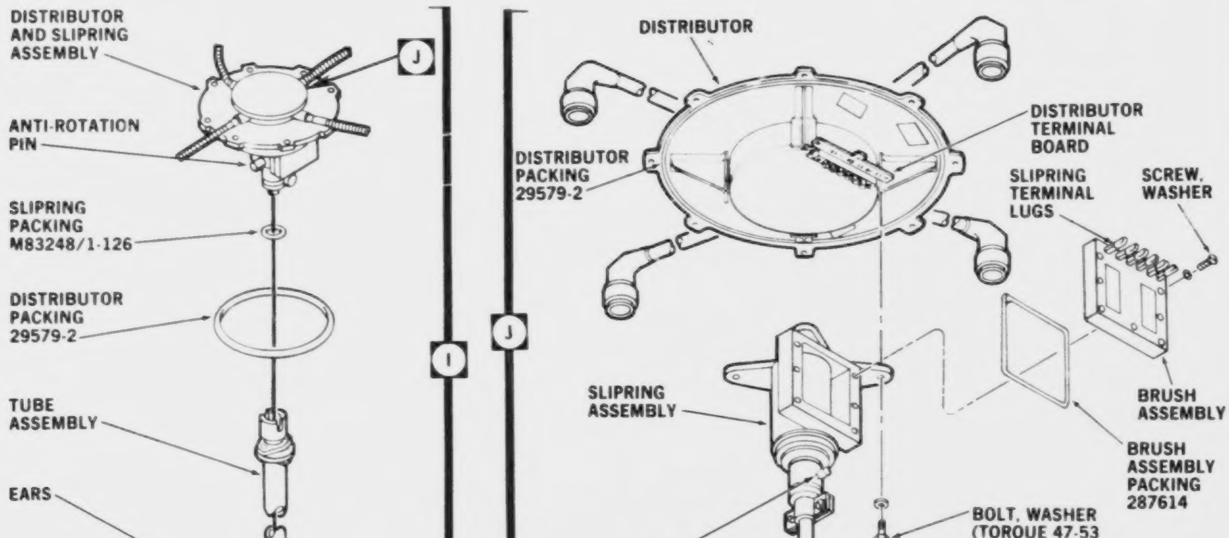

DISTRIBUTOR AND SLIPRING ASSEMBLY
J
ANTI-ROTATION PIN
SLIPRING PACKING M83248/1-126
DISTRIBUTOR PACKING 29579-2
TUBE ASSEMBLY
EARS
TUBE PACKING M83248/1-227
SLIPRING WIRE HARNESS
I
J
DISTRIBUTOR
DISTRIBUTOR TERMINAL BOARD
DISTRIBUTOR PACKING 29579-2
SLIPRING TERMINAL LUGS
SCREW, WASHER
SLIPRING ASSEMBLY
BRUSH ASSEMBLY
BRUSH ASSEMBLY PACKING 287614
BOLT, WASHER (TORQUE 47-53 IN. LBS)
ANTI-ROTATION PIN
SLIPRING WIRE HARNESS
SLIPRING PACKING M83248/1-126
UH60A-64646.5 (BH6)

FIGURE 12-58 (SHEET 4 OF 4)

12-6.6 REPLACE MAIN ROTOR BLADE DEICE SLIPRING BRUSH ASSEMBLY 12-6.6

au. Install slipring wire harness to clamp brackets with screws, washers, and clamps. Make sure clamps secure anti-chaff strip and that wire harness is centered within flange seal.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

av. Clean sealing compound from wiring harness and grommet, MS35489-13, with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

aw. Feed slipring wire harness through grommet at station 340, right buttline 16.5.

ax. Apply bead of sealing compound, Item 312, Appendix D, around wiring harness, where it passes through grommet, MS35489-13.

ay. Feed slipring wire harness through bulkhead at station 327, buttline 20 (right). Clamp harness to side of bulkhead with screw, washer, clamp, and nut.

az. Unfasten and hang main junction box cover by chain.

ba. Carefully feed slipring harness wires through grommet in main junction box.

bb. Using nuts and washers, connect wires to terminal board 3 of junction box as follows:

WIRE NO.	TERMINAL NO.
1-20-S2	1
1-10-A	2
1-20-S1	3
1-10-B	4
1-10-C	5

bc. Connect wires, No. H6395A20N, No. H6395B20N, and No. H6395C20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

bd. Install cover on main junction box.

be. Install tiedown straps, Item 360, Appendix D, as required to secure wire harness bundles.

bf. Clamp harness to stringer at station 326 with screw, washer, clamp, and nut.

bg. Do an operational check of blade deicing system (TM 55-1520-237-T).

bh. Install main transmission drip pan (PARA 2-34, PARA 2-35, or PARA 2-36).

12-6.7 REPLACE MAIN ROTOR BLADE DEICE DISTRIBUTOR 12-6.7

NOTE

Replacement of distributor is the same as PARA 12-6.5.

12-6.8 REPLACE ICING RATE METER 12-6.8

REMOVE

a. Turn off all electrical power.

b. Loosen fasteners and slowly lift icing rate meter from instrument panel until electrical connector, P132, is exposed.

c. Disconnect electrical connector, P132, and remove icing rate meter.

INSTALL

d. Turn off all electrical power.

CAUTION

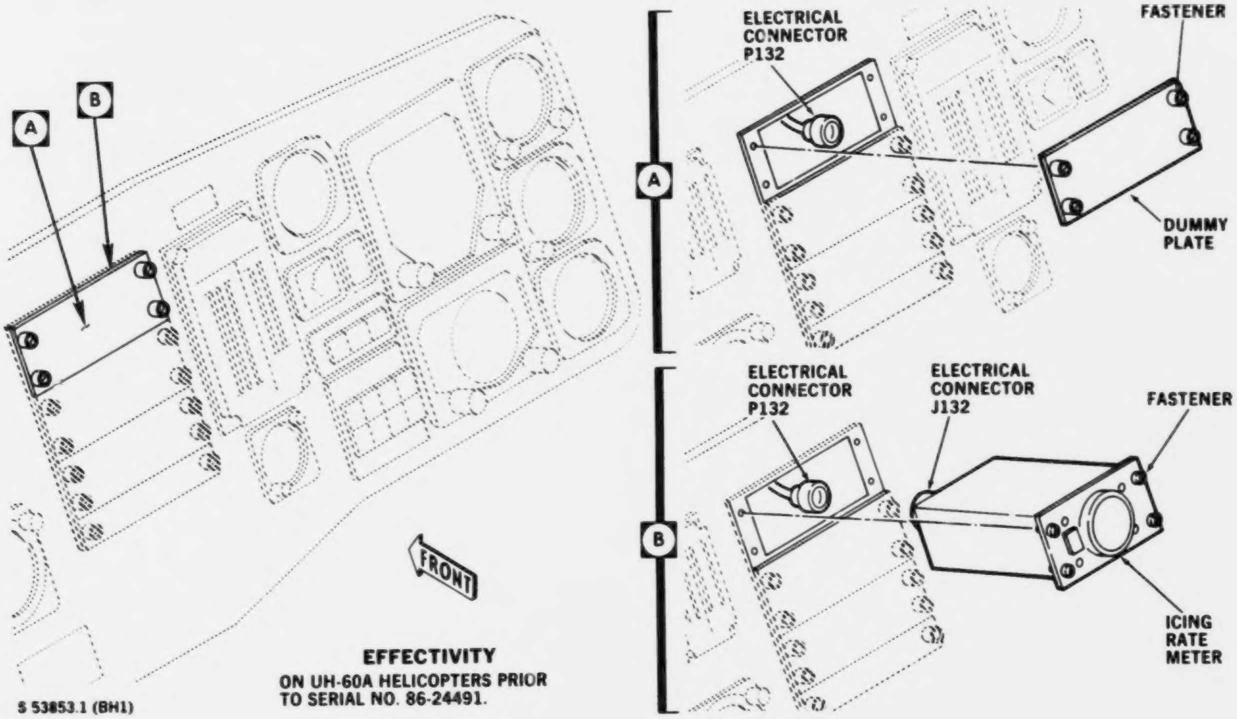
To prevent internal lighting damage, make sure NVG compatible components are installed on UH-60A helicopters serial Nos 85-24462 and subsequent, EH-60A helicopters, and helicopters modified by MWO 55-1520-237-50-20.

e. Connect electrical connector, P132, to icing rate meter.

f. Make sure area is free of foreign objects before placing meter into instrument panel.

g. Carefully place meter into instrument panel and install with fasteners.

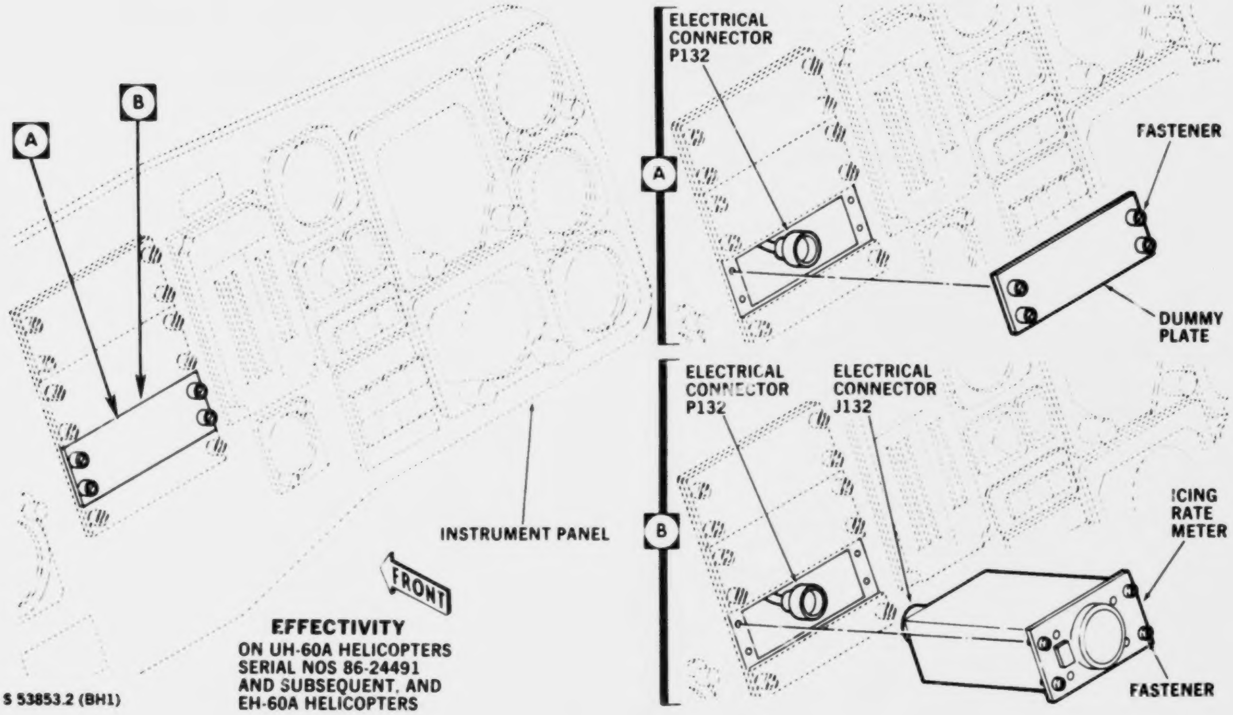
h. Do an operational check of blade deicing system (TM 55-1520-237-T).


A
B
FRONT
ELECTRICAL CONNECTOR P132
FASTENER
A
DUMMY PLATE
ELECTRICAL CONNECTOR P132
ELECTRICAL CONNECTOR J132
FASTENER
B
ICING RATE METER
S 53853.1 (BH1)

EFFECTIVITY
ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 86-24491.

FIGURE 12-59 (SHEET 1 OF 2)

12-6.8 REPLACE ICING RATE METER 12-6.8


A
B
ELECTRICAL CONNECTOR P132
FASTENER
DUMMY PLATE
INSTRUMENT PANEL
FRONT
ELECTRICAL CONNECTOR P132
ELECTRICAL CONNECTOR J132
ICING RATE METER
FASTENER
S 53853.2 (BH1)

EFFECTIVITY

ON UH-60A HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT, AND EH-60A HELICOPTERS

FIGURE 12-59 (SHEET 2 OF 2)

12-6.9 REPLACE ICING RATE METER LAMPS 12-6.9

NOTE

A post light is installed on UH-60A helicopters serial Nos 85-24462 and subsequent, EH-60A helicopters, and helicopters modified by MWO 55-1520-237-50-20.

REMOVE

a. Turn off all electrical power.

b. Grip edges of PRESS TO TEST switch button assembly and pull assembly off switch to expose lamps.

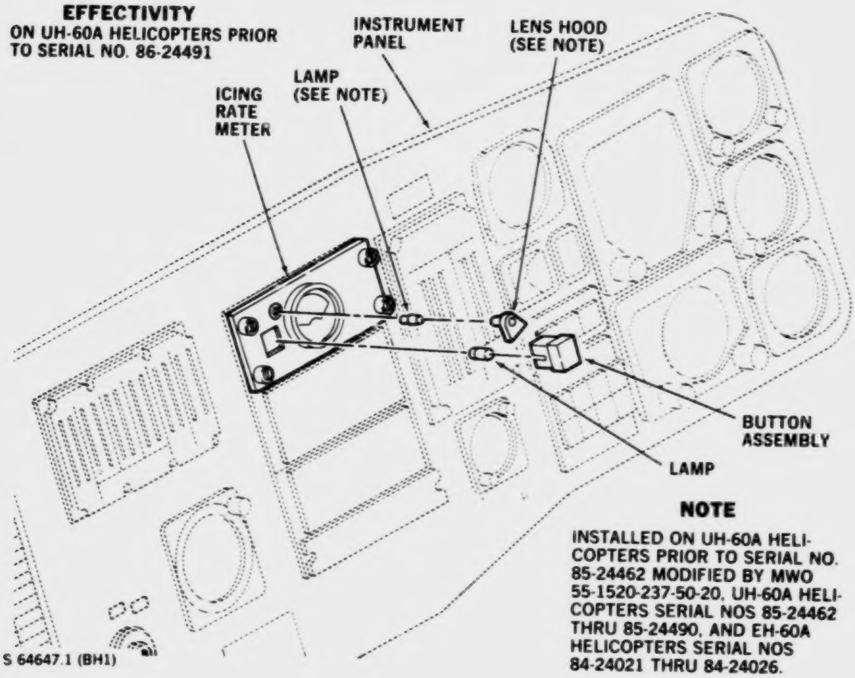
c. Pull inoperative lamps from switch.

d. If post light is installed, remove lens hood and remove lamp.

INSTALL

e. Turn off all electrical power.

f. Push lamp into lamp socket on switch.


EFFECTIVITY
ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 86-24491

INSTRUMENT PANEL
LENS HOOD (SEE NOTE)
LAMP (SEE NOTE)
ICING RATE METER
BUTTON ASSEMBLY
LAMP
S 64647.1 (BH1)

NOTE
INSTALLED ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 85-24462 MODIFIED BY MWO 55-1520-237-50-20, UH-60A HELICOPTERS SERIAL NOS 85-24462 THRU 85-24490, AND EH-60A HELICOPTERS SERIAL NOS 84-24021 THRU 84-24026.

FIGURE 12-60 (SHEET 1 OF 2)

12-6.9 REPLACE ICING RATE METER LAMPS 12-6.9

g. Press switch button assembly onto PRESS TO TEST switch.

h. If post light is installed, push lamp into lens hood and push into post.

i. Do an operational check of instrument panel lights (TM 55-1520-237-T).

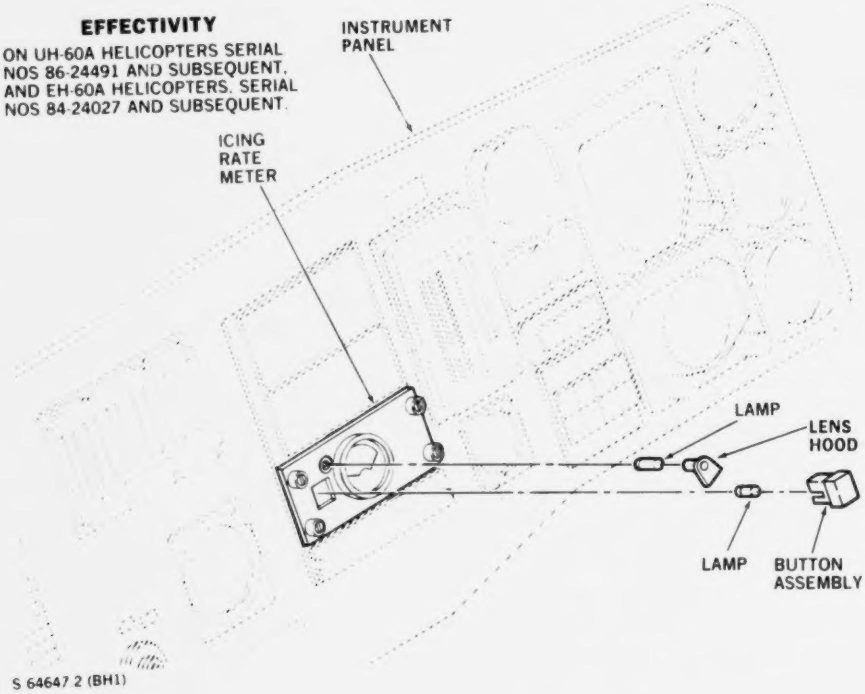

EFFECTIVITY
ON UH-60A HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT, AND EH-60A HELICOPTERS. SERIAL NOS 84-24027 AND SUBSEQUENT.
INSTRUMENT PANEL
ICING RATE METER
LAMP
LENS HOOD
LAMP
BUTTON ASSEMBLY
S 64647 2 (BH1)

FIGURE 12-60 (SHEET 2 OF 2)

12-6.10 REPLACE BLADE DEICE CONTROL PANEL 12-6.10

REMOVE

a. Turn off all electrical power.

b. Loosen fasteners and slowly lift blade deice control panel from instrument panel until electrical connector, P133, is exposed.

c. Disconnect electrical connector, P133, and remove control panel.

INSTALL

d. Turn off all electrical power.

CAUTION

To prevent internal lighting damage, make sure NVG compatible components are installed on UH-60A helicopters serial Nos 85-24462 and subsequent, EH-60A helicopters, and helicopters modified by MWO 55-1520-237-50-20.

e. Connect electrical connector, P133, to control panel.

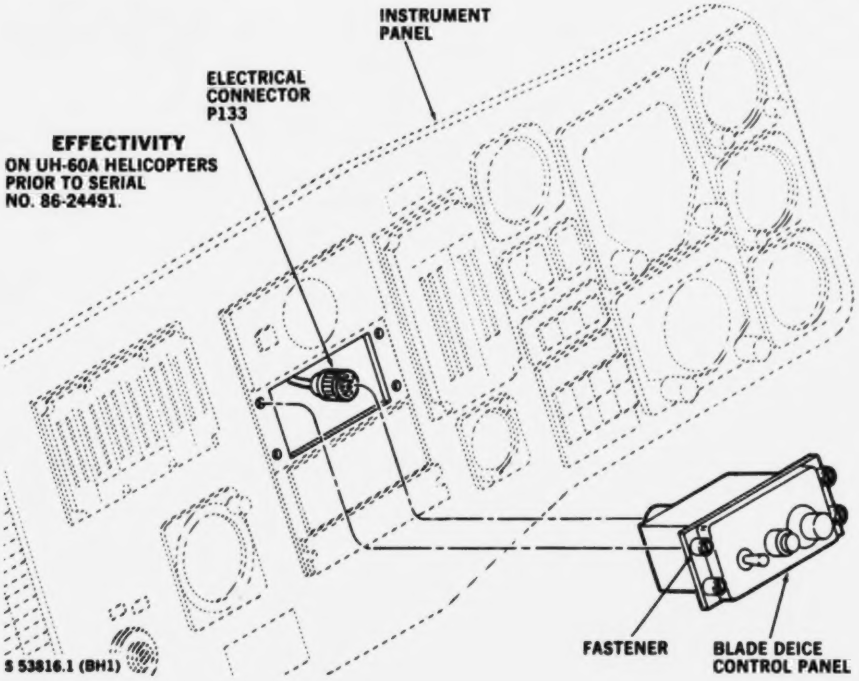

INSTRUMENT PANEL
ELECTRICAL CONNECTOR P133
EFFECTIVITY
ON UH-60A HELICOPTERS PRIOR TO SERIAL NO. 86-24491.
FASTENER
BLADE DEICE CONTROL PANEL
S 53816.1 (BH1)

FIGURE 12-61 (SHEET 1 OF 2)

12-6.10 REPLACE BLADE DEICE CONTROL PANEL 12-6.10

f. Make sure area is free of foreign objects before placing control panel into instrument panel.

g. Carefully place control panel into instrument panel and install with fasteners.

h. Do an operational check of blade deicing system (TM 55-1520-237-T).

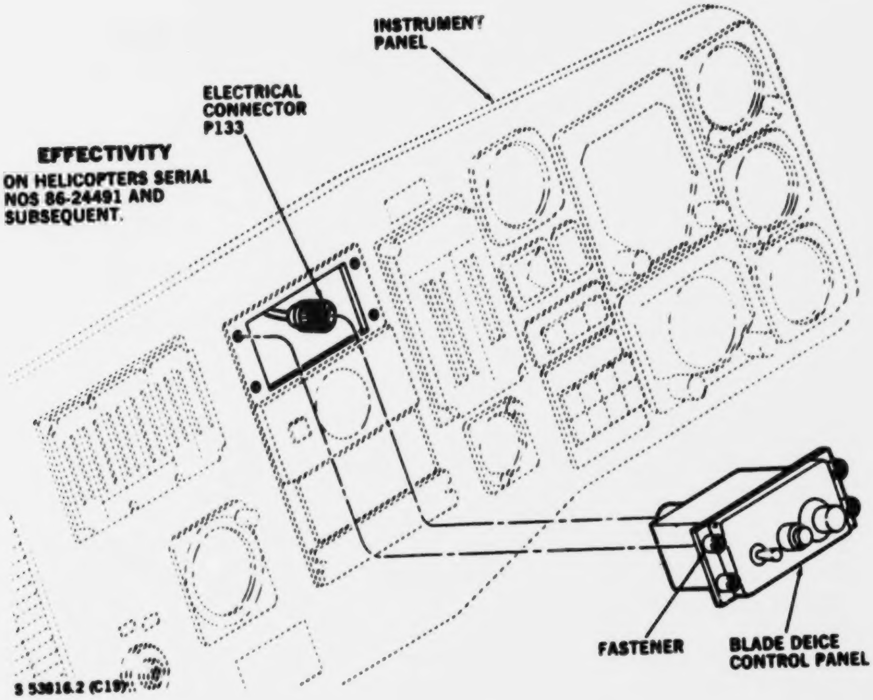

INSTRUMENT PANEL
ELECTRICAL CONNECTOR P133
EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.
FASTENER
BLADE DEICE CONTROL PANEL
S 53816.2 (C19)

FIGURE 12-61 (SHEET 2 OF 2)

12-6.11 REPLACE DEICE CONTROL PANEL TEST-IN-PROGRESS LAMP 12-6.11

REMOVE

a. Turn off all electrical power.

b. Unscrew lens assembly from control panel.

c. Pull inoperative lamp from lens assembly.

INSTALL

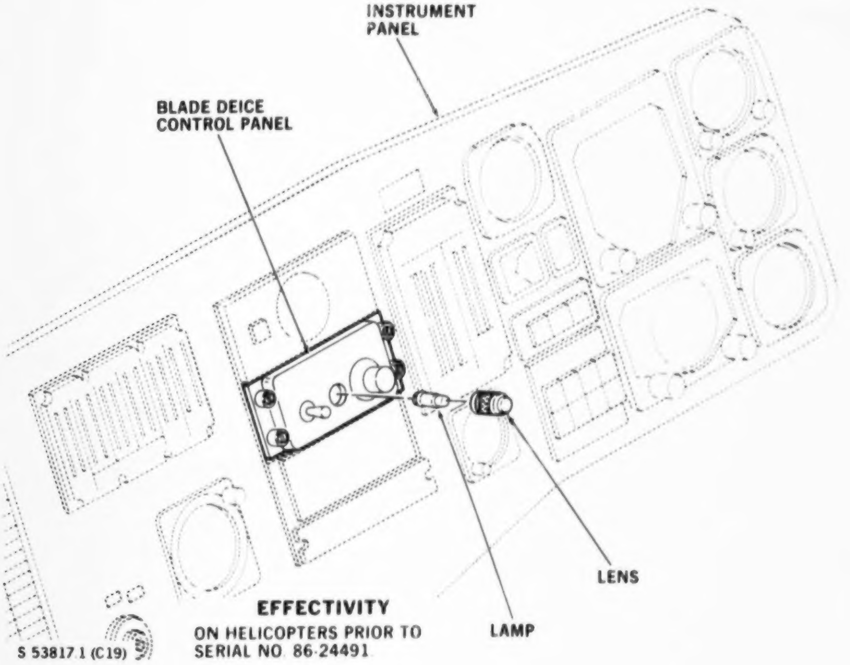
d. Turn off all electrical power.

e. Push lamp into lens assembly.

f. Screw lens assembly into control panel.

g. Turn on electrical power and make sure copilot's circuit breaker panel LIGHTS ADSY circuit breaker is pushed in.

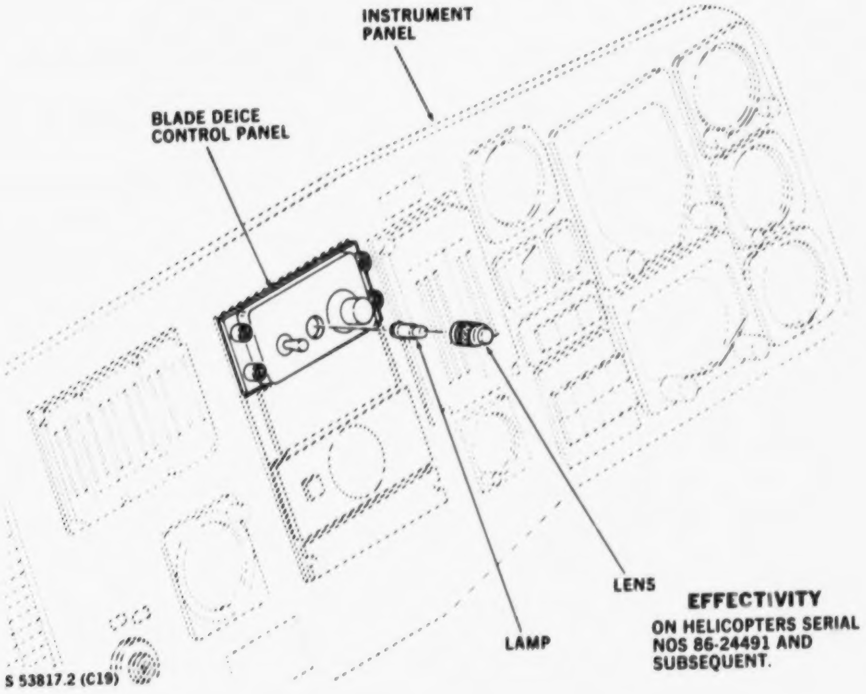
h. Press TEST IN PROGRESS indicator and check that indicator lamp lights.


INSTRUMENT PANEL
BLADE DEICE CONTROL PANEL
LENS
LAMP
S 53817.1 (C19)

EFFECTIVITY
ON HELICOPTERS PRIOR TO SERIAL NO. 86-24491

FIGURE 12-62 (SHEET 1 OF 2)

12-6.11 REPLACE DEICE CONTROL PANEL TEST-IN-PROGRESS LAMP 12-6.11


INSTRUMENT PANEL
BLADE DEICE CONTROL PANEL
LENS
LAMP
S 53817.2 (C19)

EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.

FIGURE 12-62 (SHEET 2 OF 2)

12-6.12 REPLACE BLADE DEICE CONTROL PANEL 12-6.12

REMOVE

a. Turn off all electrical power.

b. Loosen two setscrews and remove knob from MODE rotary switch.

c. Unscrew (counterclockwise) TEST IN PROGRESS indicator lens cap, and remove cap and lamp assembly.

d. Remove three mounting screws from information plate and disconnect plate from control panel.

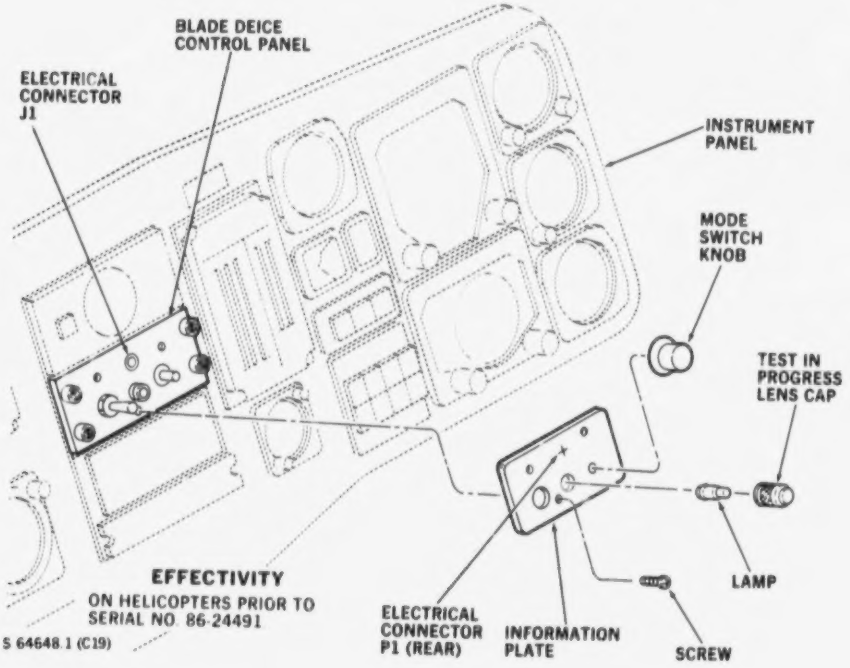
INSTALL

e. Turn off all electrical power.

NOTE

Be sure all 7 information plate lamps are installed in information plate (PARA 12-6.13).

f. Carefully connect information plate electrical connector, P1, to control panel assembly electrical connector, J1.


BLADE DEICE CONTROL PANEL
ELECTRICAL CONNECTOR J1
INSTRUMENT PANEL
MODE SWITCH KNOB
TEST IN PROGRESS LENS CAP
LAMP
ELECTRICAL CONNECTOR P1 (REAR)
INFORMATION PLATE
SCREW
S 64648.1 (C19)

EFFECTIVITY

ON HELICOPTERS PRIOR TO SERIAL NO. 86-24491

FIGURE 12-63 (SHEET 1 OF 2)

12-6.12 REPLACE BLADE DEICE CONTROL PANEL 12-6.12

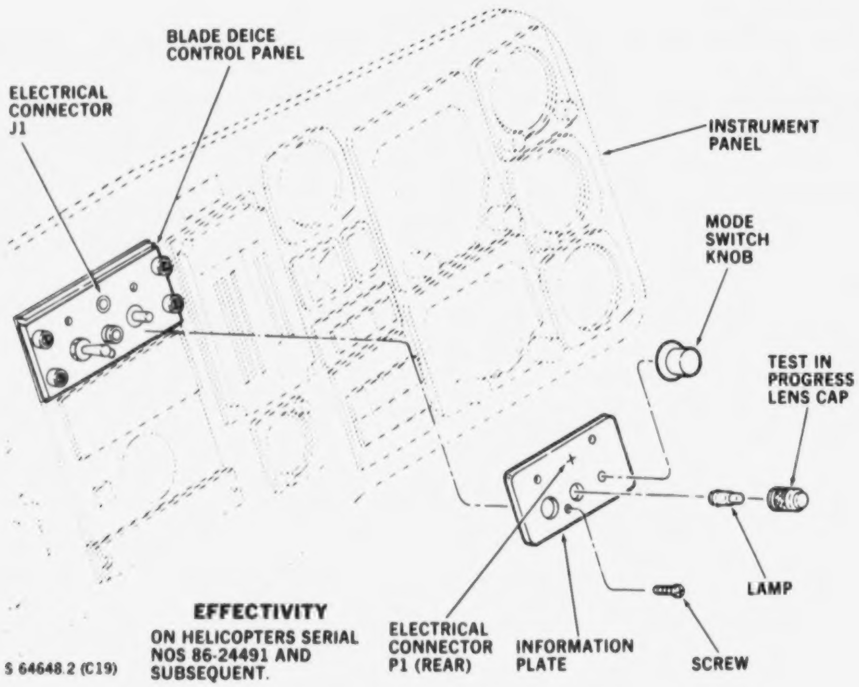

BLADE DEICE CONTROL PANEL
ELECTRICAL CONNECTOR J1
INSTRUMENT PANEL
MODE SWITCH KNOB
TEST IN PROGRESS LENS CAP
LAMP
EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.
ELECTRICAL CONNECTOR P1 (REAR)
INFORMATION PLATE
SCREW
S 64648.2 (C19)

FIGURE 12-63 (SHEET 2 OF 2)

g. Secure information plate with screws.

h. Screw (clockwise) lens cap and lamp assembly onto TEST IN PROGRESS indicator.

i. Line up MODE switch knob setscrews with flat surfaces on shaft of MODE switch and push knob onto shaft. Be sure knob pointer is lined up with information plate stenciling. Tighten setscrews.

j. Make sure area is free of foreign objects.

k. Apply electrical power to helicopter (PARA 1-6.3).

l. Make sure LIGHTS NON FLT circuit breaker is in.

m. Turn INST LT NON FLT control to BRT, all non-flight instrument panel lights go on. If result is not as specified, do an operational check (TM 55-1520-237-T).

12-6.13 REPLACE CONTROL PANEL INFO PLATE LAMPS 12-6.13

REMOVE

a. Turn off all electrical power.

b. Remove blade deice control panel information plate (PARA 12-6.12).

c. Remove moisture seal from lamp to be replaced.

d. Turn slotted lamp until slot lines up with guides in information plate.

e. Remove lamp from information plate.

INSTALL

f. Turn off all electrical power.

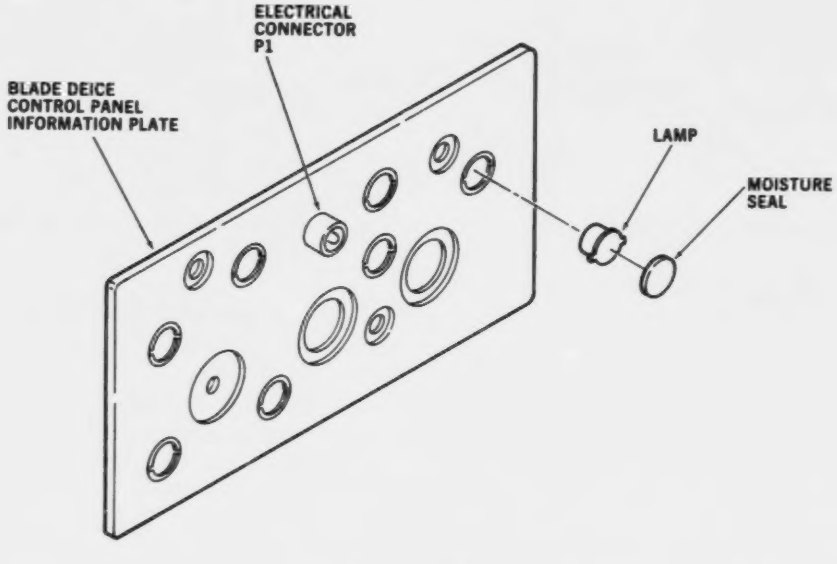
g. Place lamp in information plate receptacle.

h. Line up slot in lamp with information plate guides.

i. Turn lamp clockwise to lock in place.

j. Seal lamp receptacle by applying moisture seal.

k. Install blade deice control panel information plate (PARA 12-6.12).


ELECTRICAL CONNECTOR P1
BLADE DEICE CONTROL PANEL INFORMATION PLATE
LAMP
MOISTURE SEAL

REAR VIEW

S 64649 (C11)

FIGURE 12-64

12-6.14 REPLACE BLADE DEICE CONTROLLER 12-6.14

REMOVE

a. Turn off all electrical power.

b. Unfasten overhead soundproofing panel between stations 327 and 343, right buttline 23 (PARA 2-32).

c. Disconnect electrical connectors, P324 and P325, from deice controller.

d. Remove screws attaching deice controller to support structure and remove controller.

INSTALL

e. Turn off all electrical power.

f. Fasten deice controller to support structure with screws, washers, and lockwashers.

g. Connect electrical connector, P324, to electrical connector, J2, and electrical connector, P325, to electrical connector, J1, on deice controller.

h. Make sure area is free of foreign objects before installing soundproofing.

i. Fasten cabin overhead soundproofing panel (PARA 2-32).

j. Do an operational check of blade deicing system (TM 55-1520-237-T).

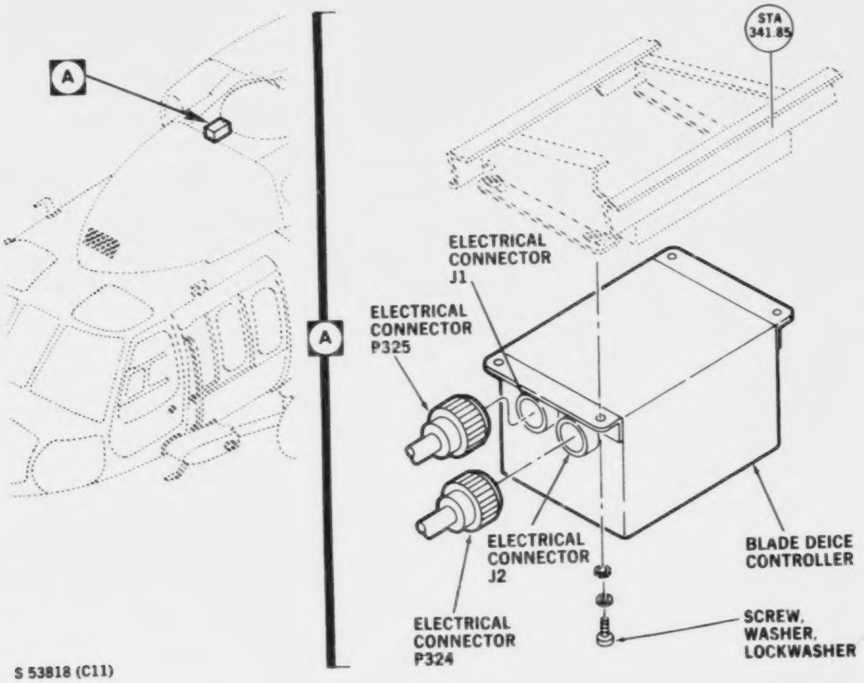

A
STA 341.85
A
ELECTRICAL CONNECTOR J1
ELECTRICAL CONNECTOR P325
ELECTRICAL CONNECTOR J2
BLADE DEICE CONTROLLER
ELECTRICAL CONNECTOR P324
SCREW, WASHER, LOCKWASHER
S 53818 (C11)

FIGURE 12-65

12-6.15 REPLACE AUXILIARY JUNCTION BOX 12-6.15

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between station 340 and 355 (PARA 2-32).

c. Disconnect electrical connectors, P332 and P333, from auxiliary junction box.

d. Unfasten and hang auxiliary junction box cover by chain.

e. Remove screws from contactor, K62, terminal shield and remove shield.

f. Remove wires from terminals, L1, L2, and L3, of contactor, K62.

g. Remove wires from terminal, 1, of current limiters, CL10, CL11,and CL12.

h. Remove wires from terminals, 1, 3, and 5, of terminal board 5.

i. Carefully pull all disconnected wires out through junction box grommets. Cut tiedown straps as required to free wires.

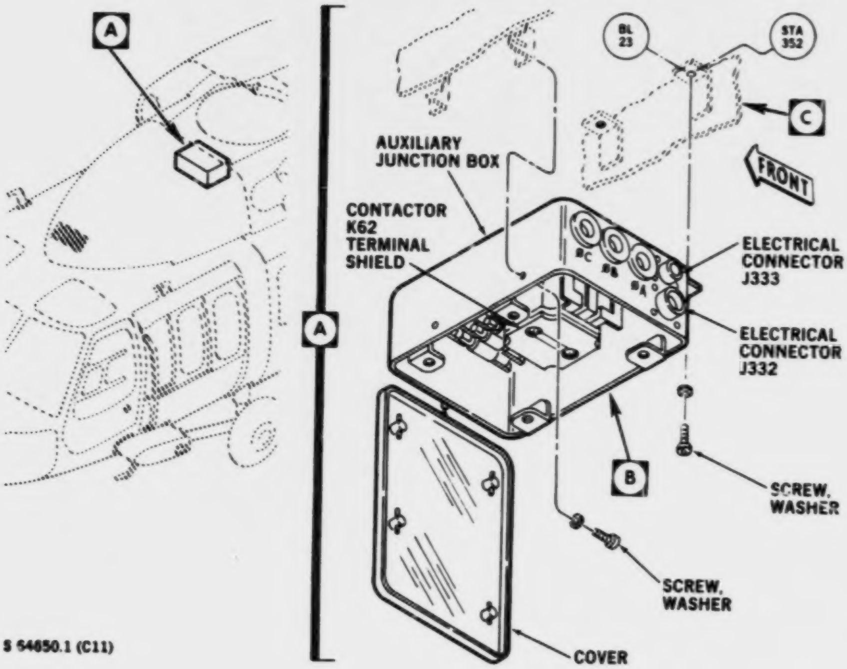

A
A
BL 23
STA 352
C
FRONT
AUXILIARY JUNCTION BOX
CONTACTOR K62 TERMINAL SHIELD
BC
BB
BA
ELECTRICAL CONNECTOR J333
ELECTRICAL CONNECTOR J332
B
SCREW, WASHER
SCREW, WASHER
COVER
S 64650.1 (C11)

FIGURE 12-66 (SHEET 1 OF 2)

12-6.15 REPLACE AUXILIARY JUNCTION BOX 12-6.15

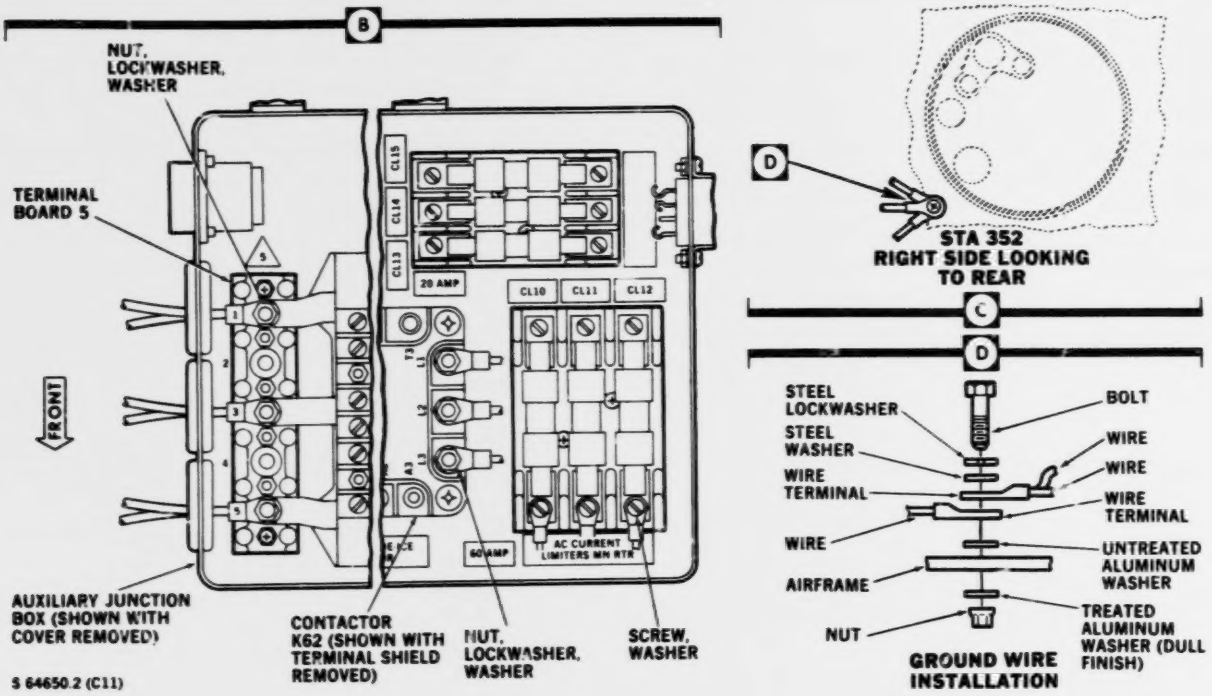

B
NUT, LOCKWASHER, WASHER
TERMINAL BOARD 5
5
1
2
3
4
5
FRONT
CL15
CL14
CL13
20 AMP
CL10
CL11
CL12
T3
L1
L2
L3
A3
60 AMP
AC CURRENT LIMITERS MN RTR
AUXILIARY JUNCTION BOX (SHOWN WITH COVER REMOVED)
CONTACTOR K62 (SHOWN WITH TERMINAL SHIELD REMOVED)
NUT, LOCKWASHER, WASHER
SCREW, WASHER
S 64650.2 (C11)
D
STA 352 RIGHT SIDE LOOKING TO REAR
C
D
STEEL LOCKWASHER
STEEL WASHER
WIRE TERMINAL
WIRE
AIRFRAME
NUT
BOLT
WIRE
WIRE
WIRE TERMINAL
UNTREATED ALUMINUM WASHER
TREATED ALUMINUM WASHER (DULL FINISH)
GROUND WIRE INSTALLATION

FIGURE 12-66 (SHEET 2 OF 2)

j. Remove wires, No. H6434A20N, No. H6434B20N, and No. H6435A20N, from airframe ground at station 352.

k. Remove auxiliary junction box mounting screws and remove junction box from helicopter.

INSTALL

l. Turn off all electrical power.

m. Place junction box on mounting brackets in cabin ceiling and secure with screws and washers.

n. Unfasten and hang junction box cover by chain.

o. Carefully feed wires listed below through junction box grommets marked A, B, C and connect to terminal board, 5, using washers, lockwashers, and nuts:

GROMMET	WIRE NO.	TERMINAL BOARD 5
A	X8D06A	1
A	X8E06A	1
B	X9D06B	3
B	X9E06B	3
C	X10D06C	5
C	X10E06C	5

p. Carefully feed remaining wires through unmarked junction box grommet and connect to contactor, K62, and current limiters, CL10, CL11, and CL12, as follows:

12-6.15 REPLACE AUXILIARY JUNCTION BOX 12-6.15

WIRE NO.	CONNECT TO	ATTACHING HARDWARE
H6431A10A	CL10-1	SCREW, WASHER
H6432A10B	CL11-1	SCREW, WASHER
H6433A10C	CL12-1	SCREW, WASHER
H6379A10A	K62-L1	NUT, LOCK-WASHER, WASHER
H6380A10B	K62-L2	NUT, LOCK-WASHER, WASHER
H6381A10C	K62-L3	NUT, LOCK-WASHER, WASHER

q. Route ground wires, No. H6434A20N, No. H6434B20N, and No H6435A20N, out of unmarked junction box grommet.

r. Make sure airframe ground at station 352 is clean, for good electrical connection.

s. Connect ground wires, No. H6434A20N, No. H6434B20N, and No. H6435A20N, to airframe ground at station 352 as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

t. Form wires into bundles using tiedown straps, Item 360, Appendix D.

u. Connect electrical connectors, P332 and P333, to junction box connectors, J332 and J333, respectively.

v. Install terminal shield on contactor, K62, with screws.

w. Install cover on junction box using cover fasteners.

x. Do an operational check of blade deicing system (TM 55-1520-237-T).

y. Make sure area is free of foreign objects before installing soundproofing panels.

z. Install soundproofing panels (PARA 2-32).

12-6.16 REPLACE CURRENT LIMITER 12-6.16

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 340 and 355 (PARA 2-32).

c. Unfasten and hang auxiliary junction box cover by chain.

d. Pull current limiter from current limiter holder.

INSTALL

e. Turn off all electrical power.

f. Press current limiter into current limiter holder.

g. Place junction box cover on junction box and fasten.

h. Make sure area is free of foreign objects before installing soundproofing panels.

i. Do an operational check of blade deicing system (TM 55-1520-237-T).

j. Install soundproofing panels between stations 340 and 355 (PARA 2-32).

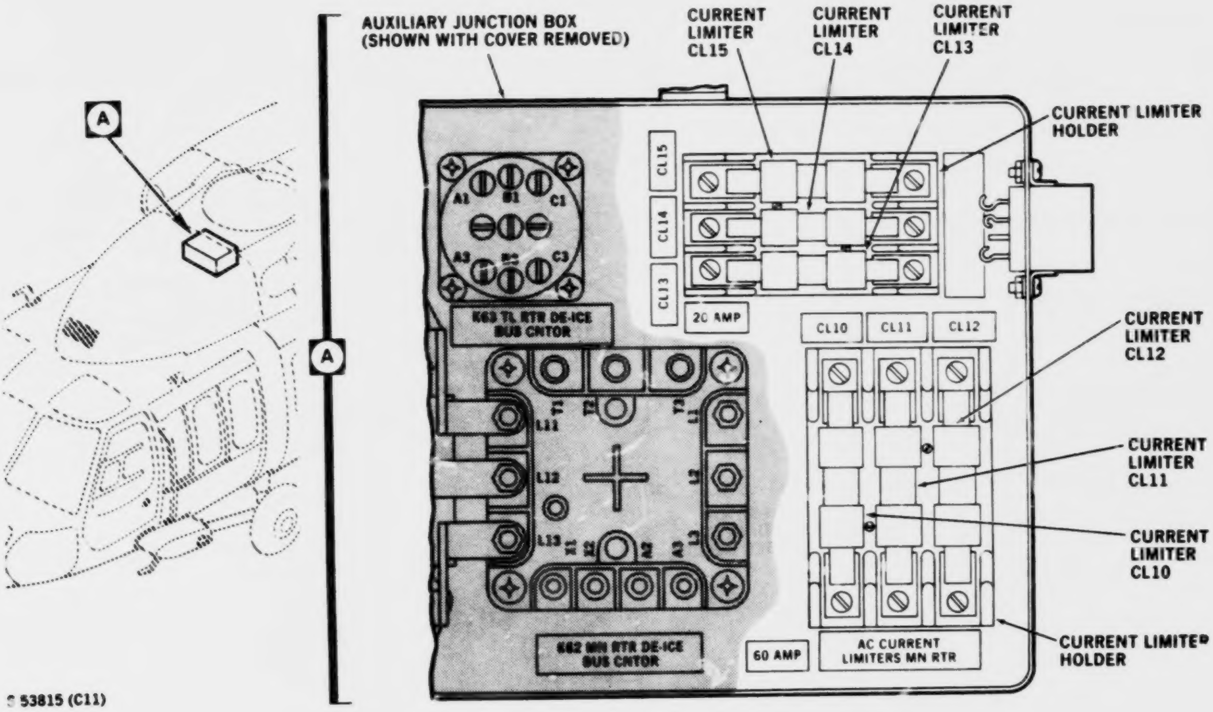

A
AUXILIARY JUNCTION BOX (SHOWN WITH COVER REMOVED)
CURRENT LIMITER CL15
CURRENT LIMITER CL14
CURRENT LIMITER CL13
CURRENT LIMITER HOLDER
A
CL15
CL14
CL13
A1
B1
C1
A3
C3
663 TL RTR DE-ICE BUS CNTOR
20 AMP
CL10
CL11
CL12
CURRENT LIMITER CL12
L11
L12
L13
T1
T2
T3
CURRENT LIMITER CL11
CURRENT LIMITER CL10
662 MN RTR DE-ICE BUS CNTOR
60 AMP
AC CURRENT LIMITERS MN RTR
CURRENT LIMITER HOLDER
53815 (C11)

FIGURE 12-67

12-6.17 REPLACE CURRENT LIMITER HOLDER 12-6.17

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 340 and 355 (PARA 2-32).

c. Unfasten and hang auxiliary junction box cover by chain.

d. Pull current limiters from current limiter holder.

e. Tag and remove wires from holder.

f. Remove screws and lift current limiter holder from junction box.

INSTALL

g. Turn off all electrical power.

h. Install current limiter holder in auxiliary junction box with screws.

i. Connect wires to current limiter holder with screws and washers. Untag wires.

j. Press current limiters into current limiter holders.

k. Place junction box cover on junction box and fasten.

l. Make sure area is free of foreign objects before installing soundproofing panels.

m. Do an operational check of blade deicing system (TM 55-1520-237-T).

n. Install soundproofing panels between stations 340 and 355 (PARA 2-32).

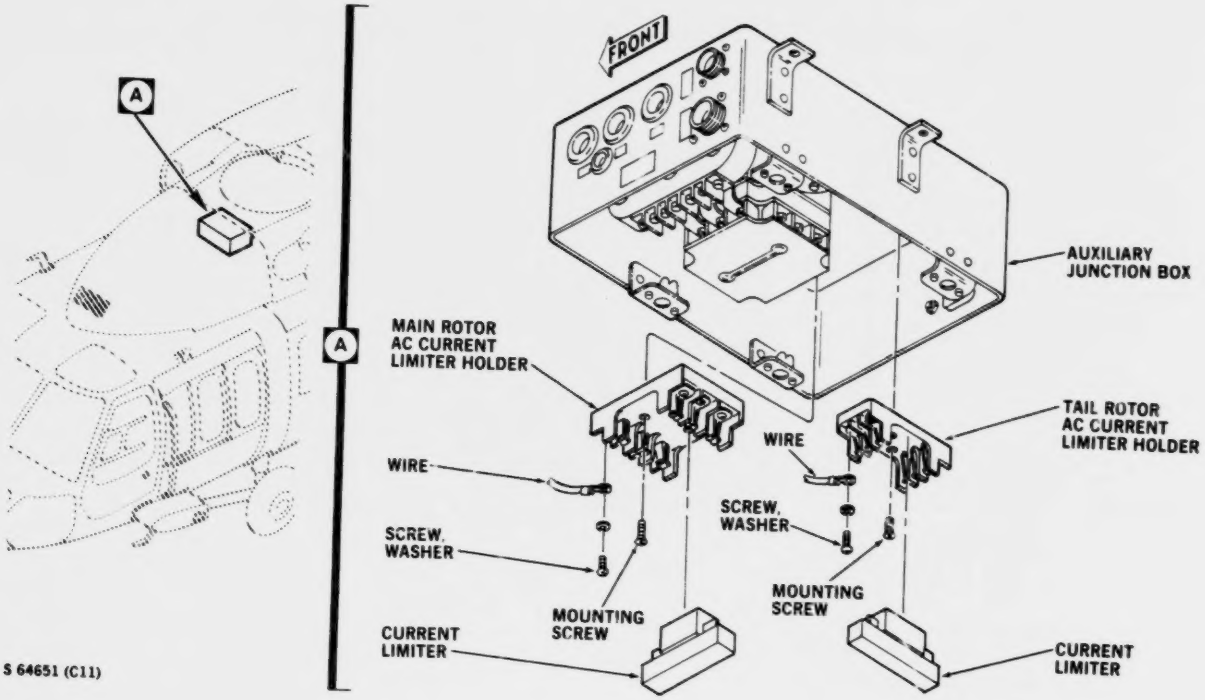

A
A
FRONT
AUXILIARY JUNCTION BOX
MAIN ROTOR AC CURRENT LIMITER HOLDER
TAIL ROTOR AC CURRENT LIMITER HOLDER
WIRE
WIRE
SCREW, WASHER
SCREW, WASHER
MOUNTING SCREW
MOUNTING SCREW
CURRENT LIMITER
CURRENT LIMITER
S 64651 (C11)

FIGURE 12-68

12-6.18 REPLACE CONTACTOR K60 12-6.18

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 310 and 330 (PARA 2-32).

c. Unfasten and hang main junction box cover by chain.

d. Remove terminal shield, No. 1, from contactor, K60.

e. Tag and remove wires from terminals, A2, B2, and C2, of contactor, K60.

f. Remove terminal shield No. 2 from contactor, K60.

g. Tag and remove wires from terminals, A1, B1, C1, X1, and X2, of contactor, K60.

h. Remove mounting screws from contactor, K60, and remove contactor, K60, from junction box.

INSTALL

i. Turn off all electrical power.

j. Position contactor, K60, over mounting holes in main junction box and secure with screws and washers.

k. Connect wires to terminals, A1, B1, and C1, of contactor, K60 using nuts, lockwashers, and washers. **TORQUE NUTS TO 18 - 20 INCH-POUNDS.**

l. Connect wires to terminals, X1 and X2, of contactor, K60 using screws, lockwashers, and washers.

m. Remove tags from installed wires.

n. Place terminal shield No. 2 over terminals, A1, B1, C1, X1, and X2, of contactor, K60.

o. Connect wires to terminals, A2, B2, and C2, of contactor, K60, using nuts, lockwashers, and washers. **TORQUE NUTS TO 18 - 20 INCH-POUNDS.**

p. Remove tags from installed wires.

q. Install terminal shield, No. 1, on contactor, K60 using screws.

r. Install cover on junction box using cover fasteners.

s. Do an operational check of blade deicing system (TM 55-1520-237-T).

t. Make sure area is free of foreign objects before installing soundproofing panels.

u. Install soundproofing panels (PARA 2-32).

12-6.18 REPLACE CONTACTOR K60 12-6.18

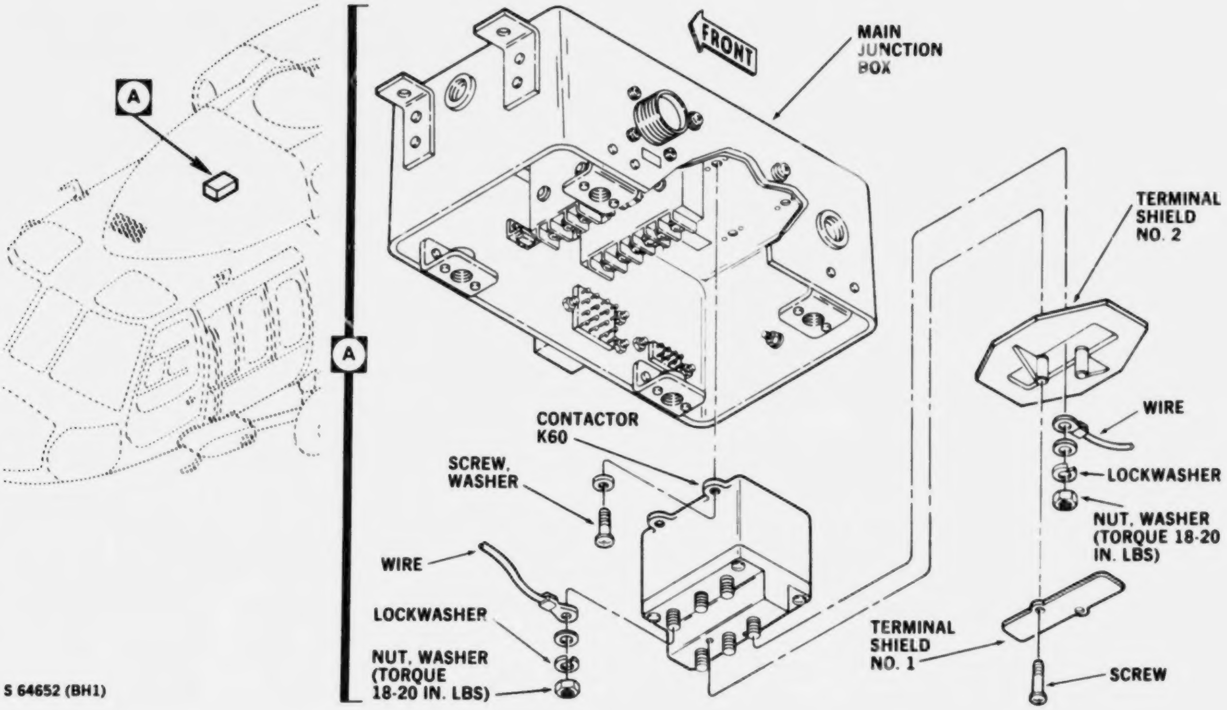

A
A
FRONT
MAIN JUNCTION BOX
TERMINAL SHIELD NO. 2
WIRE
LOCKWASHER
NUT, WASHER (TORQUE 18-20 IN. LBS)
CONTACTOR K60
SCREW, WASHER
WIRE
LOCKWASHER
NUT, WASHER (TORQUE 18-20 IN. LBS)
TERMINAL SHIELD NO. 1
SCREW
S 64652 (BH1)

FIGURE 12-69

12-6.19 REPLACE RELAY K61 12-6.19

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 340 and 355 (PARA 2-32).

c. Disconnect electrical connectors, P332 and P333, from auxiliary ac junction box.

d. Unfasten and hang auxiliary junction box cover by chain.

e. Remove auxiliary junction box mounting screws and hang junction box by external wiring.

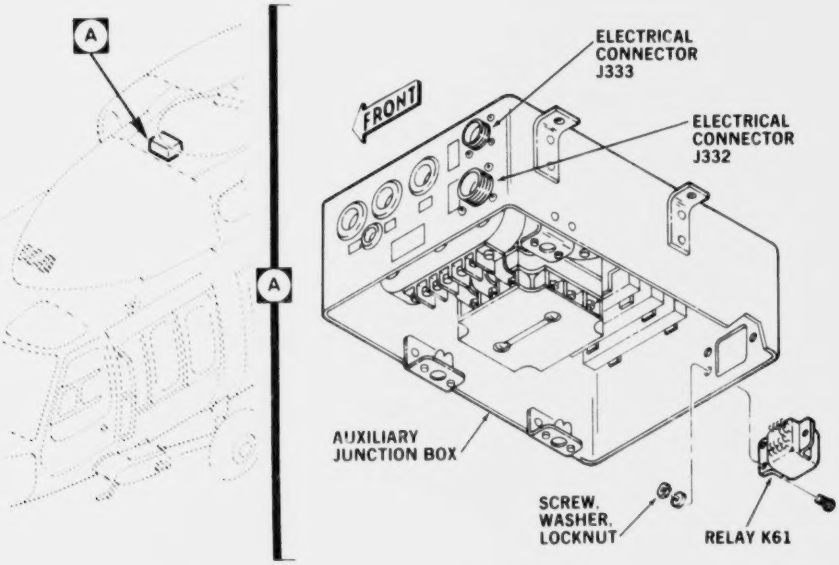
f. Slide insulation sleeving off terminals of relay, K61.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

g. Tag and unsolder wires at terminals of relay, K61.

h. Remove mounting screws from relay, K61, and remove relay, K61, from junction box.


A
A
FRONT
ELECTRICAL CONNECTOR J333
ELECTRICAL CONNECTOR J332
AUXILIARY JUNCTION BOX
SCREW, WASHER, LOCKNUT
RELAY K61

S 64653 (C16)

FIGURE 12-70

12-6.19 REPLACE RELAY K61

INSTALL

i. Turn off all electrical power.

j. Install relay, K61, in junction box using screws, washers, and locknuts.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

k. Solder, Item 328, Appendix D, wires to terminals of relay, K61 and remove tags.

l. Slide insulation sleeving, Item 179, Appendix D, over soldered terminals of relay, K61.

m. Position junction box on mounting brackets in cabin ceiling and secure with screws and washers.

n. Connect electrical connectors, P332 and P333, to junction box electrical connectors, J332 and J333, respectively.

o. Install cover on junction box using cover fasteners.

p. Do an operational check of blade deicing system (TM 55-1520-237-T).

q. Make sure area is free of foreign objects before installing soundproofing panels.

r. Install soundproofing panels (PARA 2-32).

12-6.20 REPLACE CONTACTOR K62

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 340 and 355 (PARA 2-32).

c. Unfasten and hang auxiliary junction box cover by chain.

d. Remove terminal shield from contactor, K62.

e. Tag and remove wires from terminals of contactor, K62.

f. Remove mounting screws from contactor, K62, and slide contactor, K62, toward current limiter block until free of bus bars.

g. Remove contactor, K62, from junction box.

INSTALL

h. Turn off all electrical power.

i. Position contactor, K62, in junction box with contactor, K62, terminals, L11, L12, and L13, facing bus bars.

j. Slide contactor, K62, toward bus bars until slots on bus bars engage terminals, L11, L12, and L13, of contactor, K62.

k. Secure contactor, K62, using mounting screws and washers.

l. Connect all wires to terminals of contactor, K62, using nuts, lockwashers, and washers.

m. Untag all wires.

n. Install terminal shield on contactor, K62, using screws.

o. Install cover on junction box using cover fasteners.

p. Do an operational check of blade deicing system (TM 55-1520-237-T).

q. Make sure area is free of foreign objects before installing soundproofing panels.

r. Install soundproofing panels (PARA 2-32).

12-6.20 REPLACE CONTACTOR K62 12-6.20

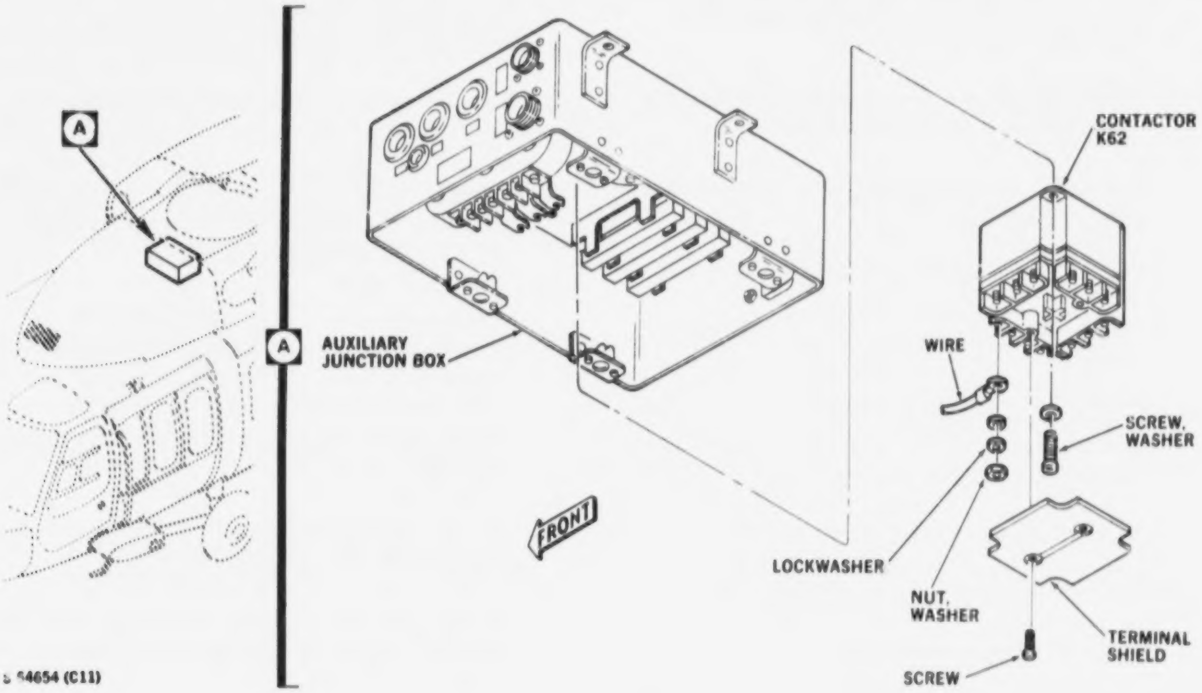

A
A
AUXILIARY JUNCTION BOX
FRONT
CONTACTOR K62
WIRE
SCREW, WASHER
LOCKWASHER
NUT, WASHER
TERMINAL SHIELD
SCREW
S 84654 (C11)

FIGURE 12-71

12-6.21 REPLACE CONTACTOR K63 12-6.21

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 340 and 355 (PARA 2-32).

c. Unfasten and hang auxiliary junction box cover by chain.

d. Slide insulating sleeving off terminals of contactor, K63.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

e. Tag and unsolder wires at terminals of contactor, K63.

f. Remove mounting screws from contactor, K63, and remove contactor, K63, from junction box.

INSTALL

g. Turn off all electrical power.

h. Place contactor, K63, over junction box mounting holes with terminals, A3, B3, and C3, turned toward contactor, K62.

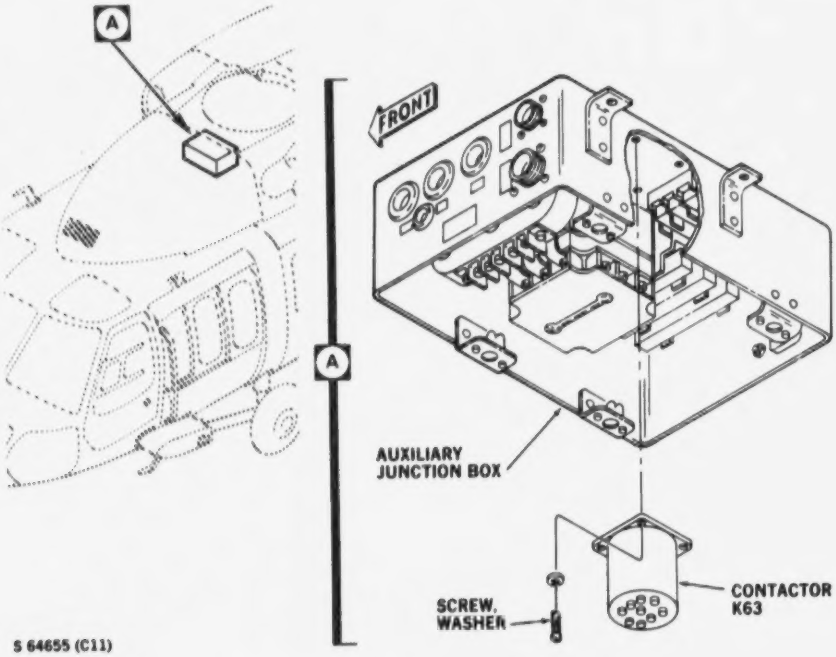


FIGURE 12-72

12-6.21 REPLACE CONTACTOR K63 12-6.21

i. Secure contactor, K63, with mounting screws and washers.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

j. Solder, Item 328, Appendix D, wires to terminals of contactor, K63.

k. Untag wires and slide insulation sleeving, Item 401, Appendix D, over soldered terminals of contactor, K63.

l. Install cover on junction box using cover fasteners.

m. Do an operational check of blade deicing system (TM 55-1520-237-T).

n. Make sure area is free of foreign objects before installing soundproofing panels.

o. Install soundproofing panels (PARA 2-32).

12-6.22 REPLACE RELAY K64 12-6.22

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 310 and 330 (PARA 2-32).

c. Unfasten and hang main junction box cover by chain.

d. Slide insulating sleeving off terminals of relay, K64.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

e. Tag and unsolder wires at terminals of relay, K64.

f. Remove junction box mounting screws and let junction box hang by external wiring.

g. Remove relay, K64, from junction box.

INSTALL

h. Turn off all electrical power.

i. Install relay, K64, in junction box using screws, washers, and locknuts.

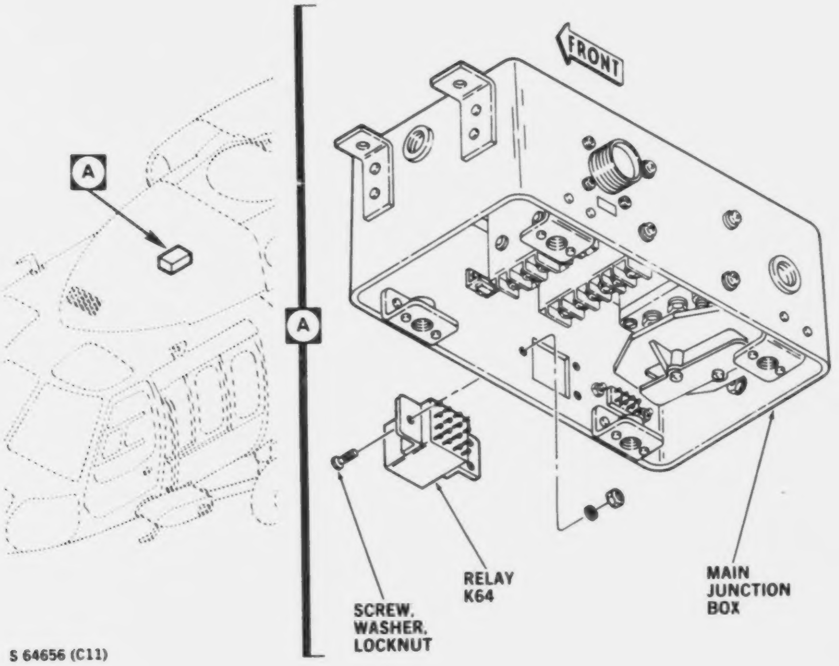


FIGURE 12-73

12-6.22 REPLACE RELAY K64 12-6.22

j. Position junction box on mounting brackets and secure with screws and washers.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

k. Solder, Item 328, Appendix D, wires to terminals of relay, K64.

l. Untag wires and slide insulation sleeving, Item 401, Appendix D, over terminals of relay, K64.

m. Install cover on junction box using cover fasteners.

n. Do an operational check of blade deicing system (TM 55-1520-237-T).

o. Make sure area is free of foreign objects before installing soundproofing panels.

p. Install soundproofing panels (PARA 2-32).

12-6.23 REPLACE RELAY K65 12-6.23

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 310 and 330 (PARA 2-32).

c. Unfasten and hang main junction box cover by chain.

d. Slide insulating sleeving off terminals of relay, K65.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

e. Tag and unsolder wires at terminals of relay, K65.

f. Remove junction box mounting screws and let junction box hang by external wiring.

g. Remove relay, K65, from junction box.

INSTALL

h. Turn off all electrical power.

i. Install relay, K65, in junction box using screws, washers, and locknuts.

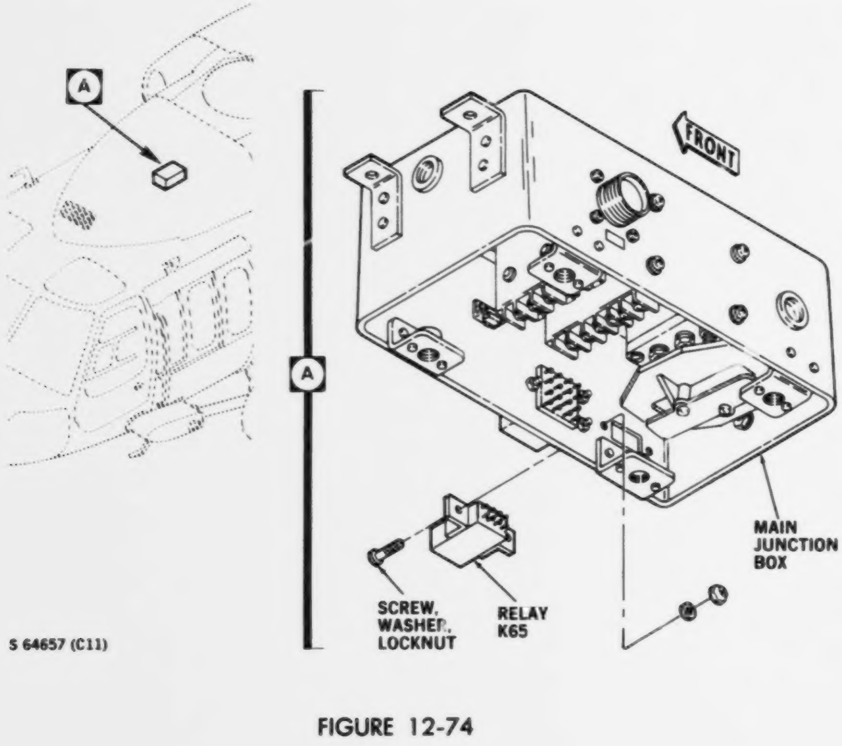


FIGURE 12-74

12-6.23 REPLACE RELAY K65

j. Position junction box on mounting brackets and secure with screws and washers.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

k. Solder, Item 328, Appendix D, wires to terminals of relay, K65.

l. Untag wires and slide insulation sleeving, Item 401, Appendix D, over terminals of relay, K65.

m. Install cover on junction box using cover fasteners.

n. Do an operational check of blade deicing system (TM 55-1520-237-T).

o. Make sure area is free of foreign objects before installing soundproofing panels.

p. Install soundproofing panels (PARA 2-32).

12-6.24 REPLACE CURRENT TRANSFORMER T10 12-6.24

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 340 and 355 (PARA 2-32).

c. Unfasten and hang auxiliary junction box cover by chain.

d. Remove contactor, K62, from junction box (PARA 12-6.20).

e. Tag and remove wires from transformer, T10.

f. Tag and remove wires from terminal board, 5.

g. Tag and pull bus bars through transformer, T10.

h. Remove transformer, T10, from junction box.

INSTALL

i. Turn off all electrical power.

j. Install current transformer, T10, using screws and washers.

k. Slide bus bars through transformer, T10, and position slotted end of bus bars on terminals, 1, 3, and 5, of terminal board, 5, and untag bus bars.

l. Connect wires and bus bars to terminal board 5 as follows: washer, bus bar, wire terminal lug, washer, lockwasher, and nut.

m. Connect wires to transformer, T10, terminal strip and untag wires.

n. Install contactor, K62 (PARA 12-6.20).

o. Untag all wires and bus bars.

p. Install cover on junction box using cover fasteners.

q. Do an operational check of blade deicing system (TM 55-1520-237-T).

r. Make sure area is free of foreign objects before installing soundproofing panels.

s. Install soundproofing panels (PARA 2-32).

12-6.24 REPLACE CURRENT TRANSFORMER T10 12-6.24

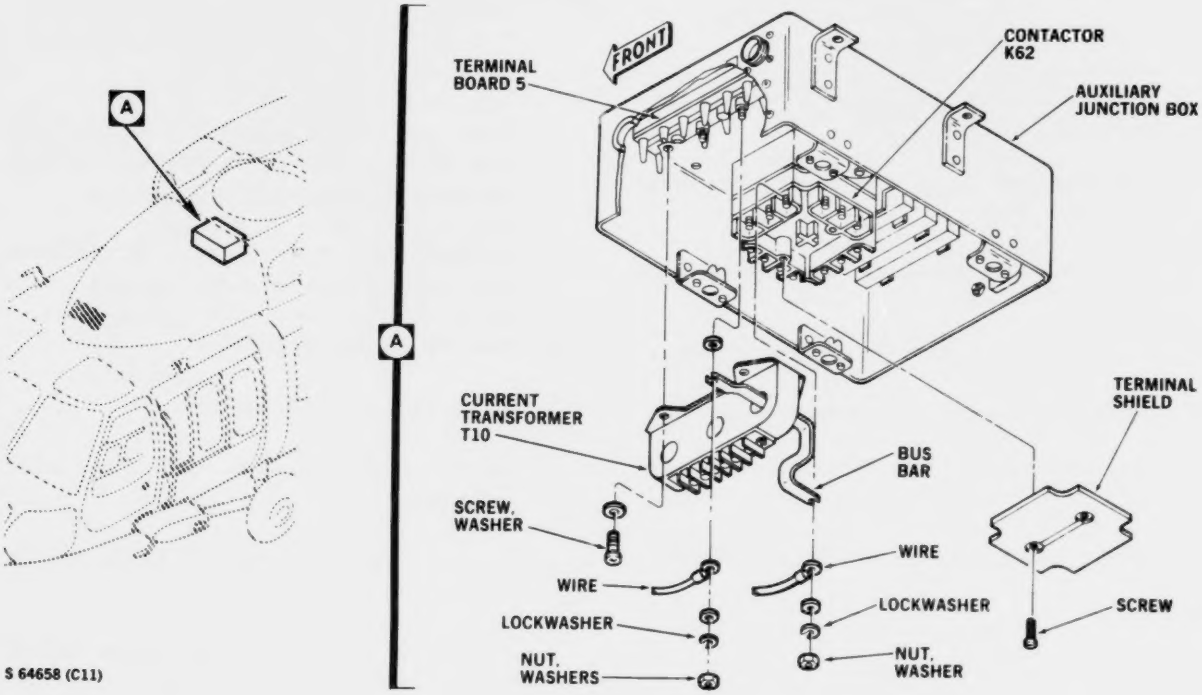

A
A
FRONT
TERMINAL BOARD 5
CONTACTOR K62
AUXILIARY JUNCTION BOX
TERMINAL SHIELD
CURRENT TRANSFORMER T10
BUS BAR
SCREW, WASHER
WIRE
WIRE
LOCKWASHER
LOCKWASHER
SCREW
NUT, WASHERS
NUT, WASHER
S 64658 (C11)

FIGURE 12-75

12-6.25 REPLACE CURRENT TRANSFORMER T14 12-6.25

REMOVE

a. Turn off all electrical power.

b. Remove overhead soundproofing panels on left side between stations 310 and 330 (PARA 2-32).

c. Unfasten and hang main junction box cover by chain.

d. Remove red, white and black wires from terminals, 2, 4, and 5 of terminal board, 3.

NOTE

The existing red, white and black wires on the input side of terminal board 3 will be reconnected when the current transformer, T14, red, white and black wires are installed.

e. Remove terminal shields No. 1 and No. 2 from contactor, K60.

f. Remove wires from terminals, A1, B1, and C1, of contactor, K60.

g. Tag and remove wires from terminals of current transformer, T14, also remove and save three resistors from current transformer, T14, terminals, T1-T4, T2-T5, and T3-T6.

h. Remove mounting screws from current transformer, T14, and carefully remove transformer and disconnected wires from main junction box.

INSTALL

i. Turn off all electrical power.

j. Cut red, white and black wires on current transformer being installed to same lengths as wires being replaced.

k. Install six new terminal lugs on ends of current transformer, T14, red, white, and black wires.

l. Position transformer over mounting holes and secure transformer with screws and washers.

m. Using nuts, lockwashers, and washers, connect red, white, and black wires to terminal board 3 of junction box as follows:

WIRE	TERMINAL NO.
(INPUT SIDE) RED	2
(OUTPUT SIDE) RED	2
(INPUT SIDE) WHITE	4
(OUTPUT SIDE) WHITE	4
(INPUT SIDE) BLACK	5
(OUTPUT SIDE) BLACK	5

n. Using nuts, lockwashers, and washers connect red, white, and black wires to contactor, K60, as follows:

12-6.25 REPLACE CURRENT TRANSFORMER T14 12-6.25

WIRE	K60 TERMINAL NO.
RED	A1
WHITE	B1
BLACK	C1

o. **TORQUE NUTS TO 18 - 20 INCH-POUNDS.**

p. Using screws, install terminal shields, No. 1 and No. 2, on contactor, K60.

q. Connect wires to current transformer, T-14, terminals.

r. Install resistors between terminals, T1-T4, T2-T5, and T3-T6, of current transformer, T14.

s. Untag all wires and install cover on junction box using cover fasteners.

t. Do an operational check of blade deicing system (TM 55-1520-237-T).

u. Make sure area is free of foreign objects before installing soundproofing panels.

v. Install soundproofing panels (PARA 2-32).

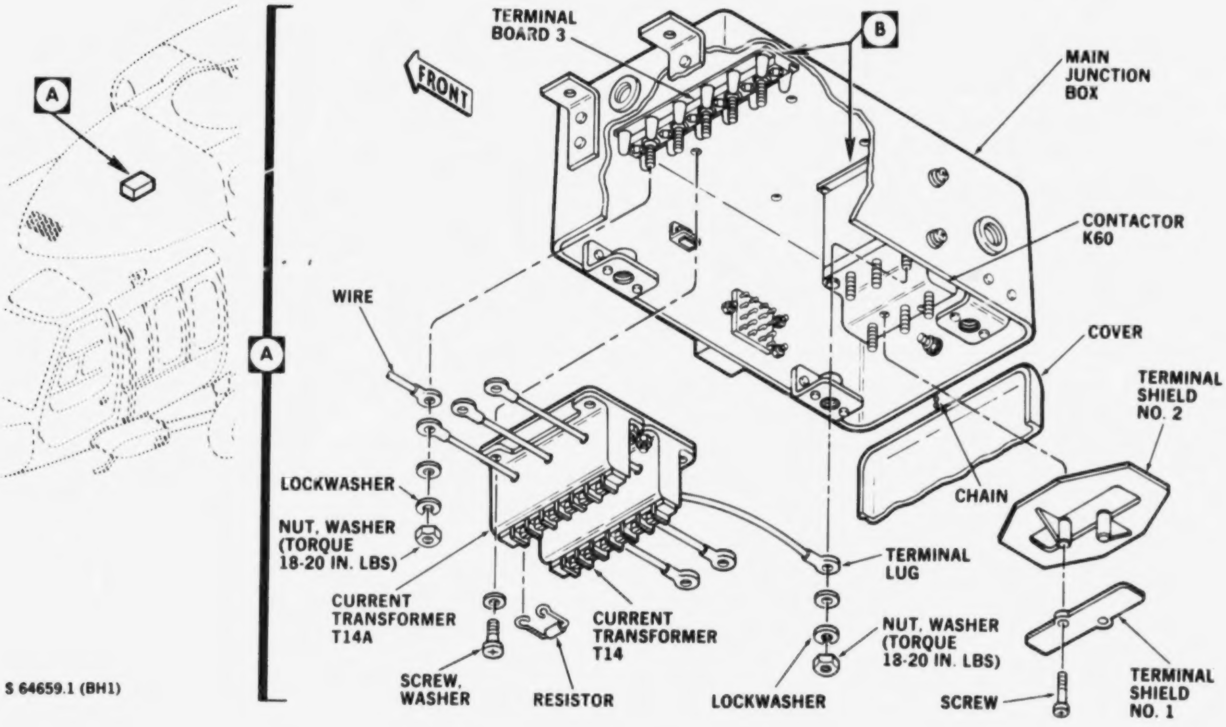
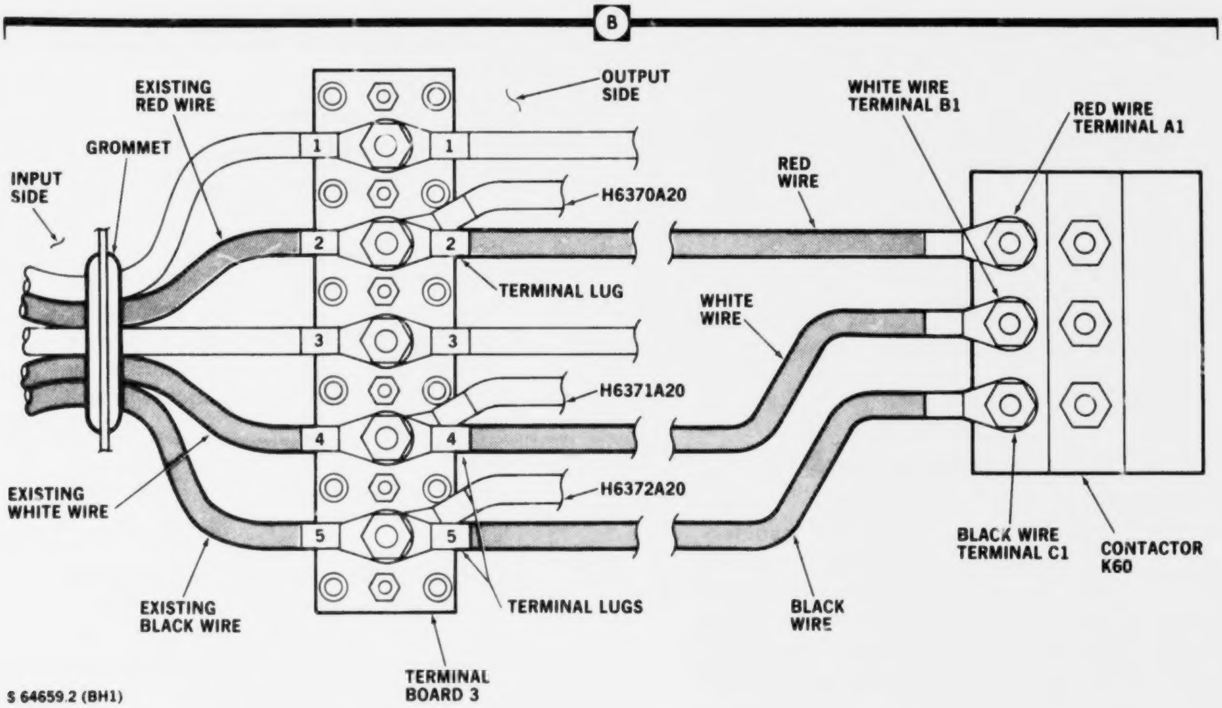

A
A
B
TERMINAL BOARD 3
FRONT
MAIN JUNCTION BOX
CONTACTOR K60
COVER
TERMINAL SHIELD NO. 2
CHAIN
WIRE
LOCKWASHER
NUT, WASHER (TORQUE 18-20 IN. LBS)
CURRENT TRANSFORMER T14A
CURRENT TRANSFORMER T14
TERMINAL LUG
NUT, WASHER (TORQUE 18-20 IN. LBS)
SCREW, WASHER
RESISTOR
LOCKWASHER
SCREW
TERMINAL SHIELD NO. 1
S 64659.1 (BH1)

FIGURE 12-76 (SHEET 1 OF 2)

12-6.25 REPLACE CURRENT TRANSFORMER T14 12-6.25


B
EXISTING RED WIRE
OUTPUT SIDE
WHITE WIRE TERMINAL B1
RED WIRE TERMINAL A1
GROMMET
INPUT SIDE
1
1
H6370A20
RED WIRE
2
2
TERMINAL LUG
WHITE WIRE
3
3
H6371A20
4
4
H6372A20
EXISTING WHITE WIRE
5
5
BLACK WIRE TERMINAL C1
CONTACTOR K60
TERMINAL LUGS
BLACK WIRE
EXISTING BLACK WIRE
TERMINAL BOARD 3

S 64659.2 (BH1)

FIGURE 12-76 (SHEET 2 OF 2)

12-6.26 REPLACE DIODE CR11, CR15, CR16 12-6.26

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 310 and 330 (PARA 2-32).

c. Unfasten and hang main junction box cover by chain.

d. Remove mounting screws from diode board and hang diode board by wiring.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

e. Unsolder and remove diode from diode board.

INSTALL

f. Turn off all electrical power.

g. Mount replacement diode on diode board. Be sure to observe polarity as indicated on board.

WARNING

Hot metal droppings occur when soldering, causing both a fire hazard and injury to personnel. Use protective clothing, including eye protection while soldering. Make sure hot metal droppings do not come in contact with skin or clothing.

h. Solder, Item 328, Appendix D, diode to diode board terminals.

i. Position diode board over mounting holes and secure with screw, washer, and locknut.

j. Install cover on junction box using cover fasteners.

k. Do an operational check of blade deicing system (TM 55-1520-237-T).

l. Make sure area is free of foreign objects before installing soundproofing panels.

m. Install soundproofing panels (PARA 2-32).

12-6.26 REPLACE DIODE CR11, CR15, CR16 12-6.26

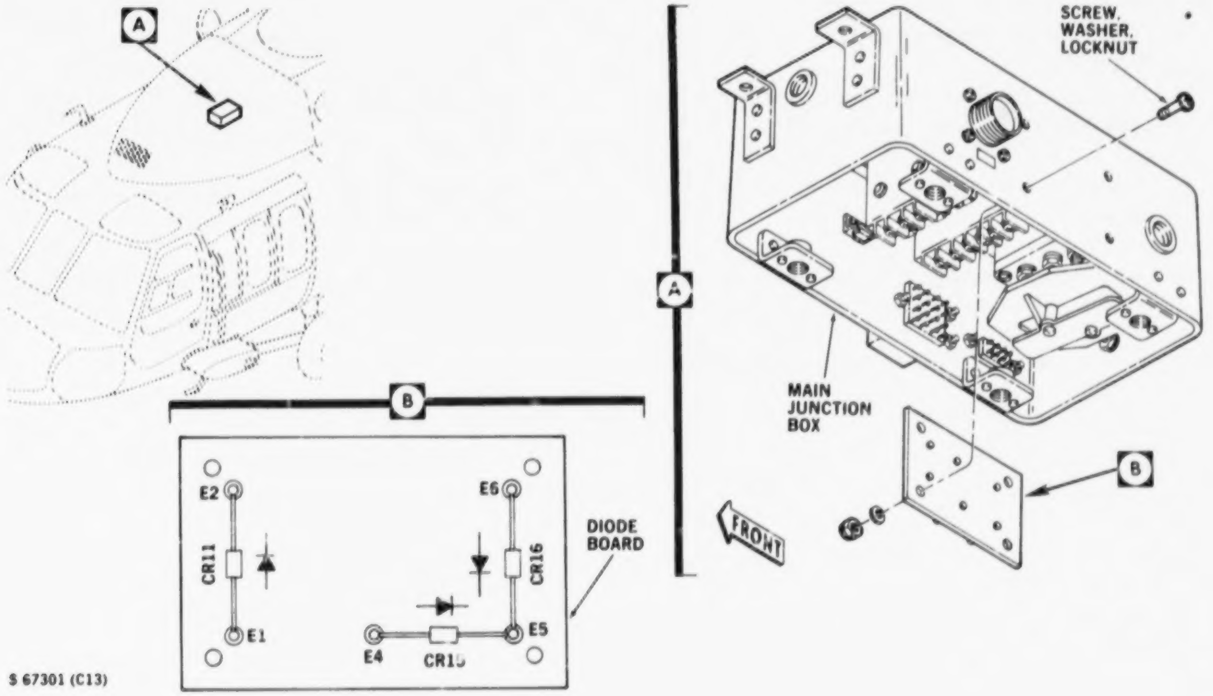

A
SCREW,
WASHER,
LOCKNUT
A
MAIN
JUNCTION
BOX
B
FRONT
B
E2
E6
CR11
CR16
DIODE
BOARD
E1
E5
E4
CR15
S 67301 (C13)

FIGURE 12-77

12-6.27 REPLACE MAIN JUNCTION BOX 12-6.27

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing panels between stations 310 and 330 (PARA 2-32).

c. Unfasten and hang junction box cover by chain.

d. Disconnect wires from terminals, 1, 2, 3, 4, and 5, of terminal board, 3.

e. Remove terminal shield, No. 1, from contactor, K60.

NOTE

Contactor terminal shield, No. 2, may fall off contactor, K60, when wires are removed from terminals, A2, B2, and B3.

f. Tag and disconnect wires from terminals, A2, B2, and C2 of contactor, K60.

g. Disconnect electrical connector, P329, from junction box.

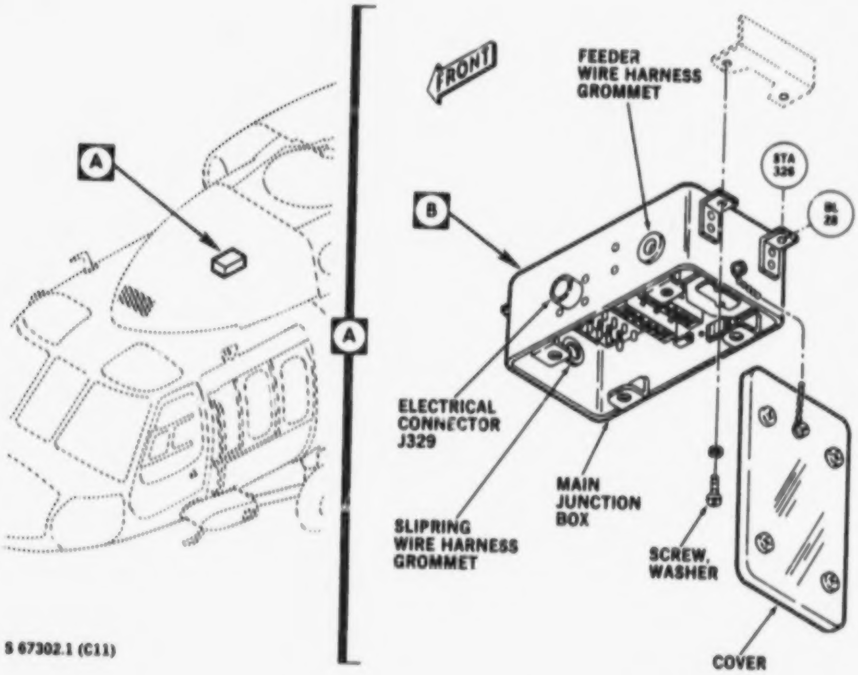

A
FRONT
FEEDER WIRE HARNESS GROMMET
STA 326
BL 28
B
A
ELECTRICAL CONNECTOR J329
MAIN JUNCTION BOX
SLIPRING WIRE HARNESS GROMMET
SCREW, WASHER
COVER
S 67302.1 (C11)

FIGURE 12-78 (SHEET 1 OF 2)

12-6.27 REPLACE MAIN JUNCTION BOX 12-6.27

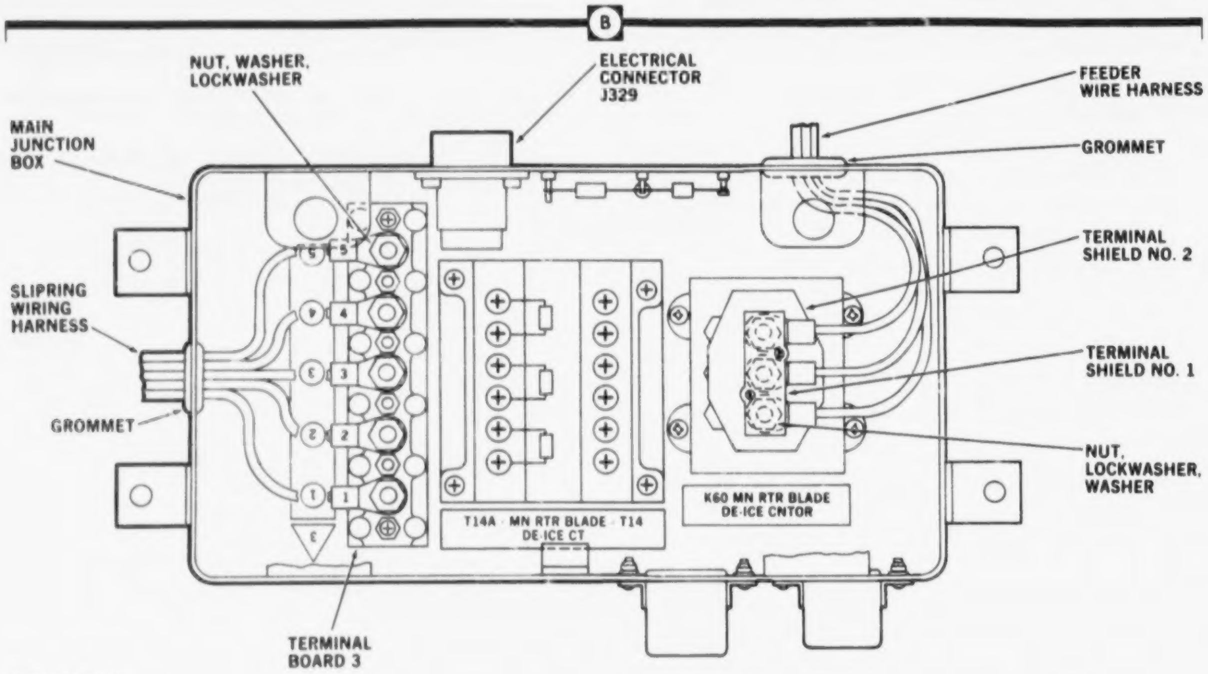

B
NUT, WASHER, LOCKWASHER
ELECTRICAL CONNECTOR J329
FEEDER WIRE HARNESS
MAIN JUNCTION BOX
GROMMET
TERMINAL SHIELD NO. 2
SLIPRING WIRING HARNESS
TERMINAL SHIELD NO. 1
GROMMET
NUT, LOCKWASHER, WASHER
5
4
3
2
1
3
T14A · MN RTR BLADE · T14 DE·ICE CT
K60 MN RTR BLADE DE·ICE CNTOR
TERMINAL BOARD 3
S 67302.2 (C11)

FIGURE 12-78 (SHEET 2 OF 2)

h. Disconnect wires, No. H6395A20N, No. H6395B20N, and No. H6356C20N, from airframe ground next to junction box.

i. Remove mounting screws from junction box and lower junction box from mounting brackets.

INSTALL

j. Turn off all electrical power.

k. Position junction box on mounting brackets and secure with screws and washers.

l. Carefully pass slipring harness wires through junction box grommet.

m. Using nuts, lockwashers, and washers, connect wires to terminal board 3 of junction box as follows:

WIRE NO.	TERMINAL NO.
1-20-S2	1
1-10-A	2
1-20-S1	3
1-10-B	4
1-10-C	5

n. Carefully pass feeder harness wires through junction box grommet.

o. Be sure terminal shield, No. 2, is installed on contactor, K60.

p. Connect feeder harness wires to terminals, A2, B2, and C2, of contactor, K60 using nuts and washers. **TORQUE NUTS TO 18 - 20 INCH-POUNDS.**

12-6.27 REPLACE MAIN JUNCTION BOX 12-6.27

q. Untag wires and install terminal shield No. 1 on contactor, K60, using screws.

r. Connect wires, No. H6395A20N, No. H6395B20N, and No. H6395C20N, to airframe ground as follows: bolt, steel lockwasher, steel washer, wire terminals, untreated aluminum washer, airframe, treated aluminum washer (dull finish), and nut.

s. Connect electrical connector, P329, to electrical connector, J329.

t. Install junction box cover using cover fasteners.

u. Do an operational check of blade deicing system (TM 55-1520-237-T).

v. Install soundproofing panels (PARA 2-32).

12-6.28 REPLACE BLADE DEICE TEST PANEL 12-6.28

REMOVE

a. Turn off all electrical power.

b. Loosen fasteners on blade deice test panel.

c. Slowly lift test panel from instrument panel until electrical connector is exposed.

d. Support test panel while disconnecting electrical connector, P134, at rear of test panel.

INSTALL

e. Turn off all electrical power.

CAUTION

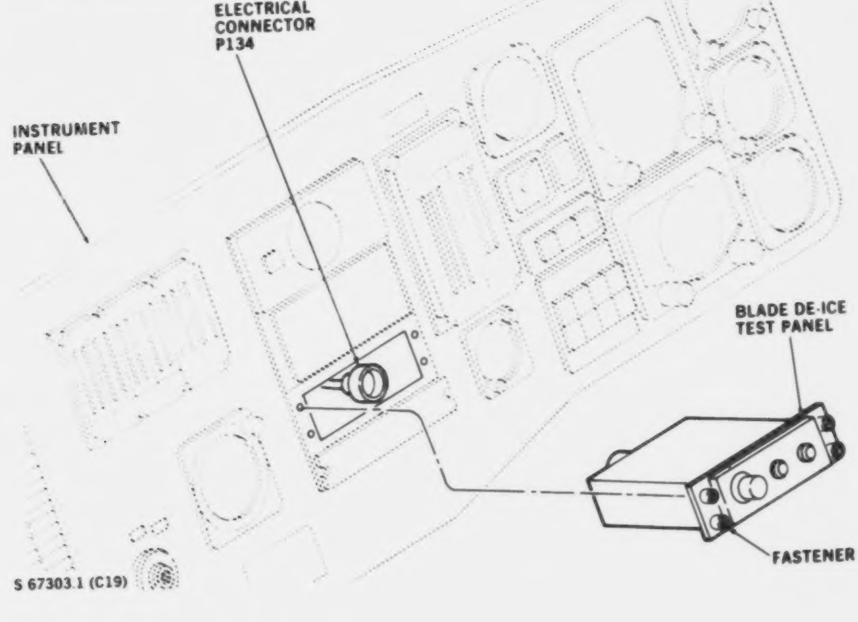
To prevent internal lighting damage, make sure NVG compatible components are installed on UH-60A helicopters serial Nos 85-24462 and subsequent, EH-60A helicopters, and helicopters modified by MWO 55-1520-237-50-20.

f. Connect electrical connector, P134 to J134, at rear of test panel.

g. Make sure area is free of foreign objects before placing test panel into instrument panel.

h. Carefully place test panel into instrument panel and secure with fasteners.

i. Do an operational check of blade deicing system (TM 55-1520-237-T).



EFFECTIVITY
ON HELICOPTERS PRIOR TO SERIAL NO. 86-24491.

FIGURE 12-79 (SHEET 1 OF 2)

12-6.28 REPLACE BLADE DEICE TEST PANEL 12-6.28

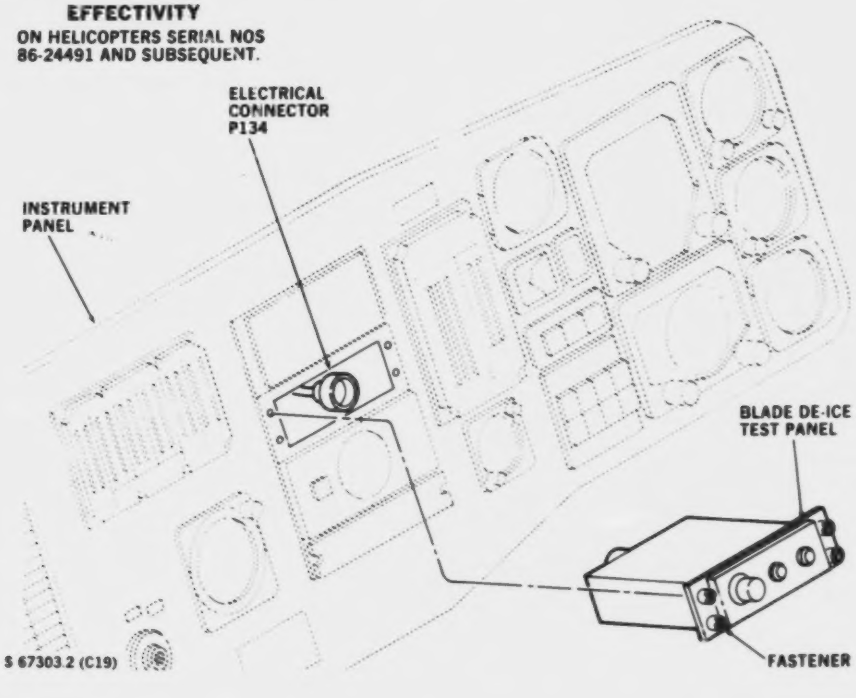

EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.
ELECTRICAL CONNECTOR P134
INSTRUMENT PANEL
BLADE DE-ICE TEST PANEL
FASTENER
S 67303.2 (C19)

FIGURE 12-79 (SHEET 2 OF 2)

12-6.29 REPLACE BLADE DEICE TEST PANEL INDICATOR LAMPS 12-6.29

REMOVE

a. Turn off all electrical power.

b. Unscrew (counterclockwise) MAIN RTR or TAIL RTR indicator lens cap.

c. Remove indicator lamp from lens cap.

INSTALL

d. Turn off all electrical power.

e. Insert replacement lamp in lens cap and screw (clockwise) lens cap onto indicator housing.

f. Turn on electrical power.

g. Press lens cap to test replacement indicator lamp.

EFFECTIVITY
ON HELICOPTERS PRIOR
TO SERIAL NO. 86-24491

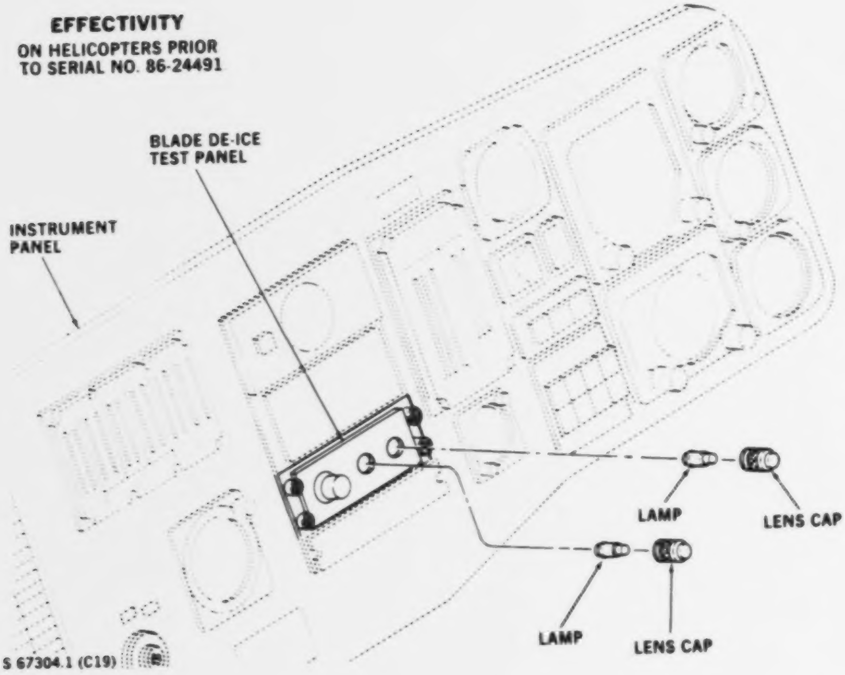

BLADE DE-ICE TEST PANEL
INSTRUMENT PANEL
LAMP
LENS CAP
LAMP
LENS CAP
S 67304.1 (C19)

FIGURE 12-80 (SHEET 1 OF 2)

12-6.29 REPLACE BLADE DEICE TEST PANEL INDICATOR LAMPS 12-6.29

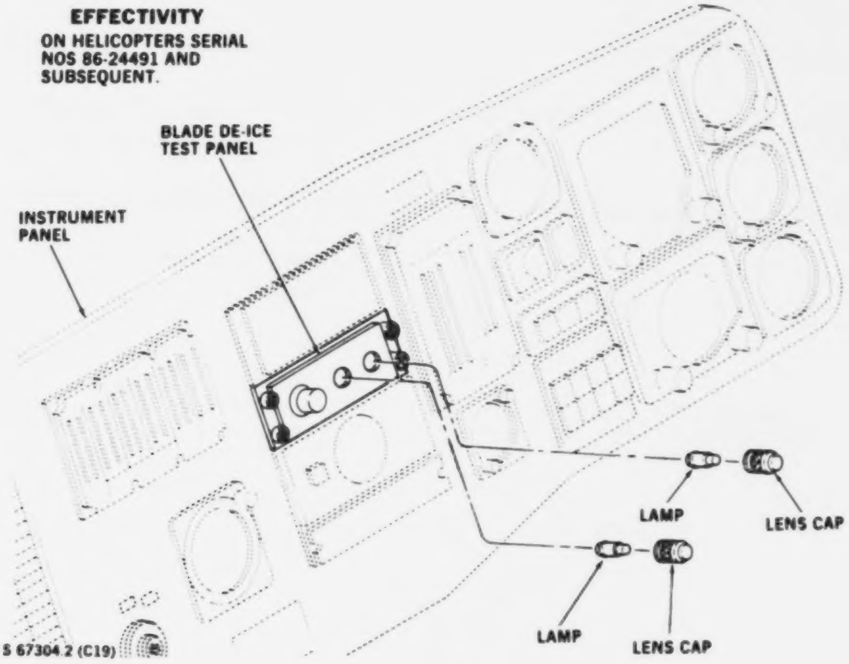

EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.
BLADE DE-ICE TEST PANEL
INSTRUMENT PANEL
LAMP
LENS CAP
LAMP
LENS CAP
S 67304.2 (C19)

FIGURE 12-80 (SHEET 2 OF 2)

12-6.30 REPLACE BLADE DEICE TEST PANEL INFORMATION PLATE 12-6.30

REMOVE

a. Turn off all electrical power.

b. Unscrew (counterclockwise) MAIN RTR and TAIL RTR indicator lens cap, and remove both cap assemblies.

c. Loosen two setscrews and remove knob from mode select switch.

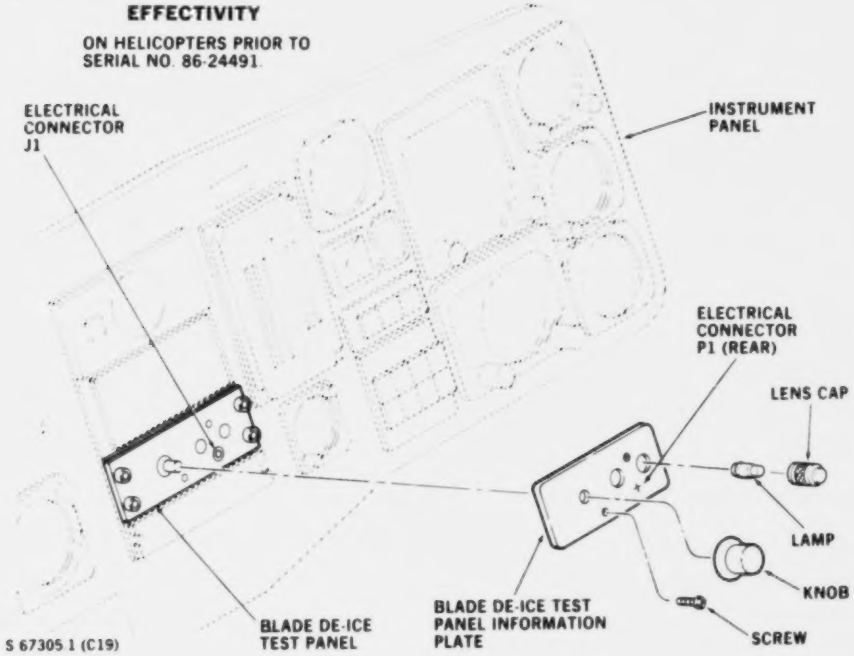
d. Remove two mounting screws from information plate and disconnect plate from control panel.

INSTALL

e. Turn off all electrical power.

NOTE

Be sure information plate lamps are installed in information plate (PARA 12-6.31).



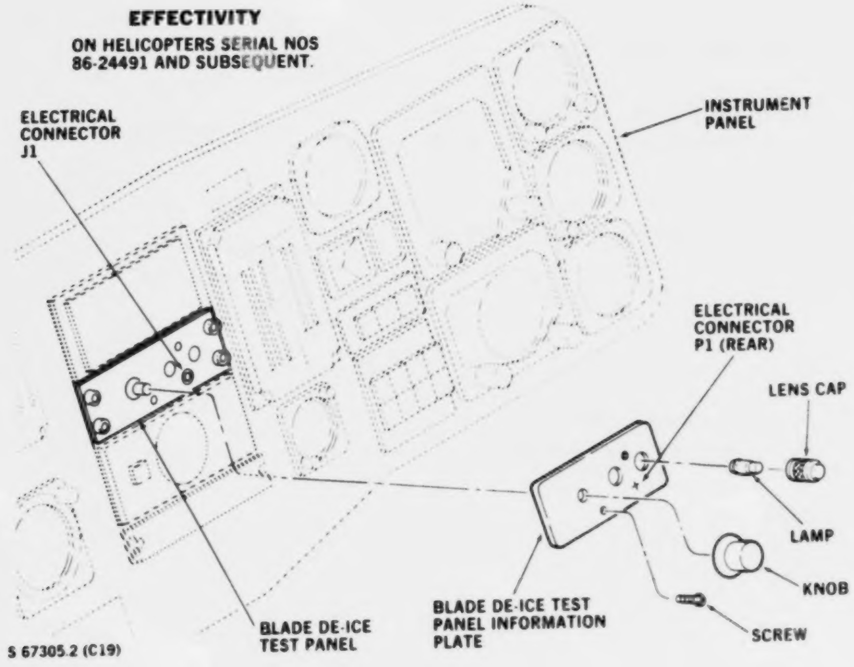
EFFECTIVITY

ON HELICOPTERS PRIOR TO SERIAL NO. 86-24491

ELECTRICAL CONNECTOR J1
INSTRUMENT PANEL
ELECTRICAL CONNECTOR P1 (REAR)
LENS CAP
LAMP
KNOB
SCREW
BLADE DE-ICE TEST PANEL INFORMATION PLATE
BLADE DE-ICE TEST PANEL
S 67305 1 (C19)

FIGURE 12-81 (SHEET 1 OF 2)

12-6.30 REPLACE BLADE DEICE TEST PANEL INFORMATION PLATE 12-6.30



EFFECTIVITY
ON HELICOPTERS SERIAL NOS 86-24491 AND SUBSEQUENT.

ELECTRICAL CONNECTOR J1
INSTRUMENT PANEL
ELECTRICAL CONNECTOR P1 (REAR)
LENS CAP
LAMP
KNOB
SCREW
BLADE DE-ICE TEST PANEL INFORMATION PLATE
BLADE DE-ICE TEST PANEL
S 67305.2 (C19)

FIGURE 12-81 (SHEET 2 OF 2)

f. Carefully connect information plate electrical connector, P1, to test panel assembly electrical connector, J1.

g. Secure information plate with screws.

h. Screw (clockwise) MAIN RTR and TAIL RTR lens cap assembly onto indicator housing.

i. Line up select switch knob setscrews with flat surfaces on shaft of switch and push knob onto shaft. Be sure knob pointer is lined up with information plate stenciling. Tighten setscrews.

j. Check for foreign objects.

k. Apply electrical power to helicopter (PARA 1-6.3).

l. Make sure LIGHTS NON FLT circuit breaker is in.

m. Turn INST LT NON FLT control to BRT, all non-flight instrument panel lights go on. If result is not as specified, do an operational check (TM 55-1520-237-T).

12-6.31 REPLACE BLADE DEICE TEST PANEL 12-6.31

REMOVE

a. Turn off all electrical power.

b. Remove test panel information plate (PARA 12-6.30).

c. Remove moisture seal from lamp to be replaced.

d. Turn slotted lamp until slot lines up with guides in information plate.

e. Remove lamp from information plate.

INSTALL

f. Turn off all electrical power.

g. Place lamp in information plate receptacle.

h. Line up slot in lamp with information plate guides.

i. Turn lamp clockwise to lock in place.

j. Seal lamp receptacle by applying moisture seal.

k. Install test panel information plate (PARA 12-6.30).

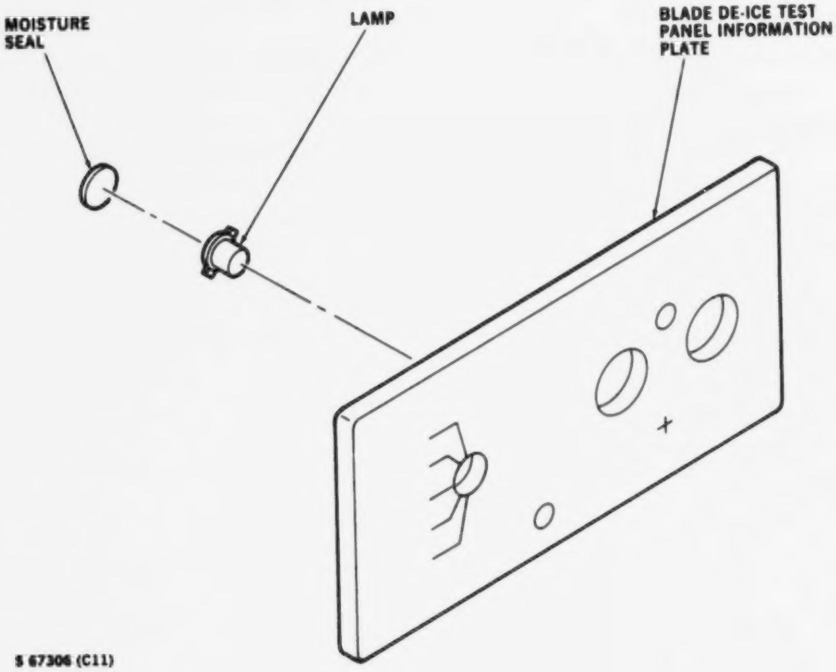

MOISTURE SEAL
LAMP
BLADE DE-ICE TEST PANEL INFORMATION PLATE
S 67306 (C11)

FIGURE 12-82

12-6.32 REPLACE DEICE OAT SENSOR 12-6.32

REMOVE

a. Turn off all electrical power.

b. Open nose compartment door.

c. Disconnect electrical connector, P122, from blade deice outside air temperature (OAT) sensor.

d. Remove sealing compound from shield and screws using a nonmetallic scraper.

e. Remove mounting screws from OAT sensor shield.

f. Remove OAT sensor shield and OAT sensor.

INSTALL

g. Turn off all electrical power.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

h. Remove remaining sealing compound from OAT sensor shield and helicopter skin by scraping with a nonmetallic scraper. Clean area to be sealed with a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

i. Apply a bead of sealing compound, Item 312, Appendix D, to mounting surface of sensor to prevent water leakage into avionics compartment.

j. Install OAT sensor and OAT sensor shield using screws, washers, and nuts.

k. Shape sealing compound squeezeout to form an even, concave, continuous seal around OAT sensor mounting plate and skin using wooden scraper, Item 386, Appendix D.

l. Apply sealing compound, Item 312, Appendix D, around seal screwheads.

m. Connect electrical connector, P122, to base of OAT sensor.

n. Close nose compartment door.

o. Do an operational check of blade deicing system (TM 55-1520-237-T).

12-6.32 REPLACE DEICE OAT SENSOR

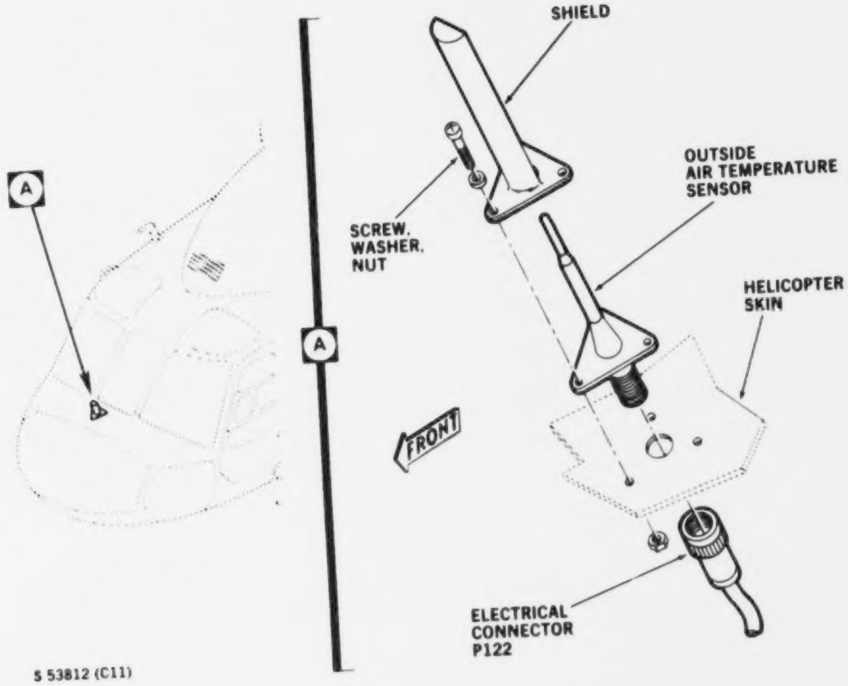

A
SHIELD
SCREW,
WASHER,
NUT
OUTSIDE
AIR TEMPERATURE
SENSOR
A
HELICOPTER
SKIN
FRONT
ELECTRICAL
CONNECTOR
P122
S 53812 (C11)

FIGURE 12-83

12-6.33 REPLACE ICE DETECTOR 12-6.33

REMOVE

a. Turn off all electrical power

b. Remove access panel mounting screws from right engine air inlet.

c. Slowly pull access cover from engine air inlet to expose electrical connector and hose fitting on ice detector.

d. Disconnect electrical connector, P326, and hose assembly from ice detector.

e. Remove mounting screws and remove detector.

INSTALL

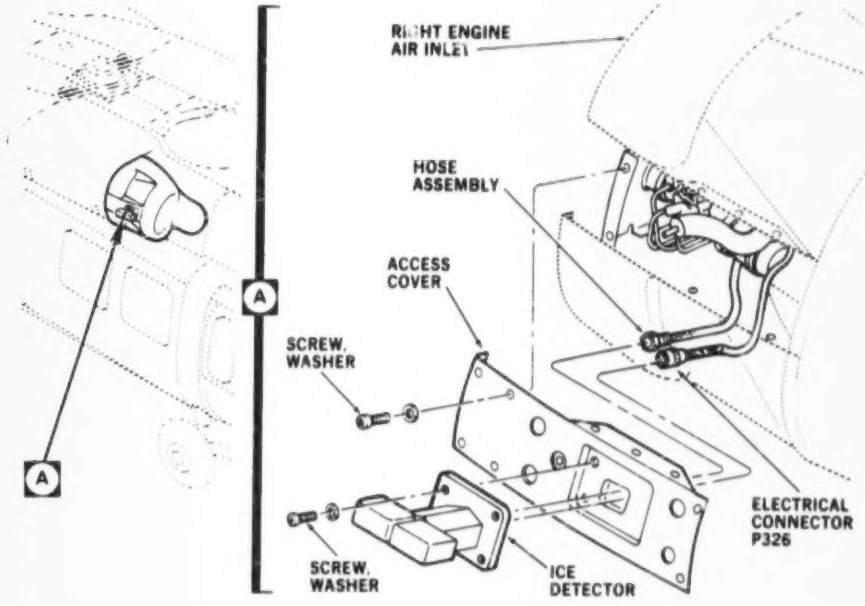
f. Turn off all electrical power.

g. Position ice detector over mounting holes in access cover and secure with screws and washers.

h. Connect electrical connector, P326, and hose assembly coupling to ice detector.

i. Install access cover to helicopter using screws and washers.

j. Do an operational check of blade deicing system (TM 55-1520-237-T).


RIGHT ENGINE AIR INLET
HOSE ASSEMBLY
ACCESS COVER
SCREW, WASHER
A
A
ELECTRICAL CONNECTOR P326
SCREW, WASHER
ICE DETECTOR

S 53824 (C11)

FIGURE 12-84

12-6.34 REPLACE ICE DETECTOR HOSE ASSEMBLY 12-6.34

REMOVE

a. Turn off all electrical power.

b. Remove access panel mounting screws from right engine air inlet.

c. Slowly pull access cover from engine air inlet to expose electrical connector, P326, and hose assembly from ice detector.

d. Disconnect electrical connector, P326, and hose assembly from ice detector.

e. Disconnect hose assembly coupling from tube assembly and remove hose assembly.

INSTALL

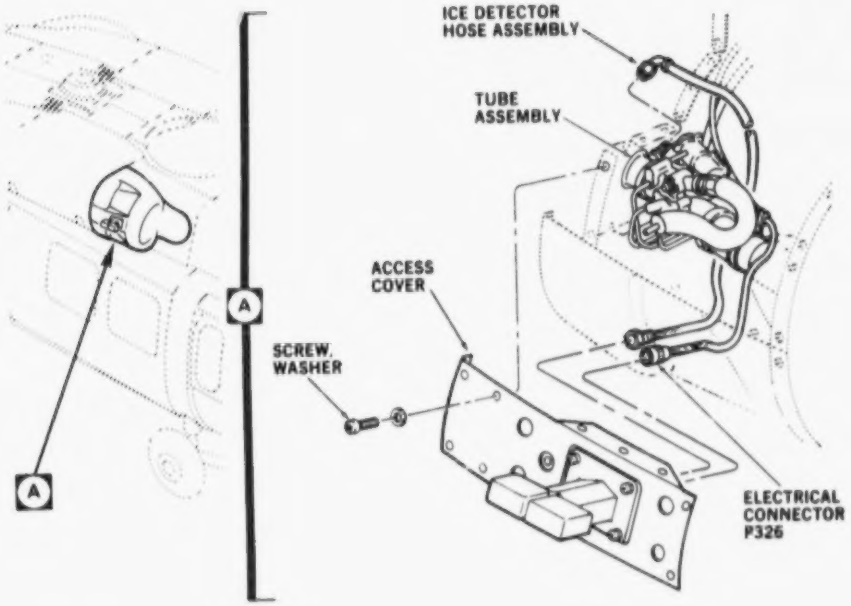
f. Turn off all electrical power.

g. Connect hose assembly coupling, with 90° bend, to tube assembly. Be sure hose assembly is positioned for connection to ice detector.

h. Connect electrical connector, P326, and hose assembly to ice detector.

i. Install access cover to helicopter using screws and washers.

j. Do an operational check of blade deicing system (TM 55-1520-237-T).


A
A
ICE DETECTOR HOSE ASSEMBLY
TUBE ASSEMBLY
ACCESS COVER
SCREW, WASHER
ELECTRICAL CONNECTOR P326

S 67307 (C11)

FIGURE 12-85

12-6.35 REPLACE TAIL ROTOR SLIPRING ROTOR 12-6.35

REMOVE

a. Turn off all electrical power.

b. Disconnect slipring electrical connectors, P611, P612, P613, and P614, from tail rotor blade electrical connectors. Remove and discard packing.

CAUTION

While tightening or loosening slipring mounting-bolt locknuts, the bolt shall be held to prevent turning. Turning bolts can damage the slipring rotor housing.

c. Remove bolts, washers, spacers, shims, and locknuts holding slipring rotor to rotor blade retention plates.

d. Remove rotor blade outer and inner retention plates (PARA 5-23 and PARA 6-25).

e. Remove slipring rotor.

INSTALL

f. Turn off all electrical power.

g. Place slipring rotor on stator.

h. Install rotor blade inner retention plate (PARA 6-25).

i. Install tail rotor blades (PARA 5-23).

j. Check locknut friction torque by doing this:

(1) Install locknuts on bolts fingertight.

(2) Using dial indicating torque wrench turn locknut in tightening direction. **TORQUE MUST BE GREATER THAN 18 INCH-POUNDS BEFORE 0.080 - 0.125 INCH EXTENDS BEYOND NUT.**

(3) If torque is less than 18 inch-pounds, replace bolt and/or locknut as required.

k. Bolt slipring rotor to rotor blade retention plate using bolts, countersunk washers, spacers, shims, washers, and locknuts. Install bolts through retention plate holes marked X. Install countersunk washer with countersunk side facing bolthead. **PEEL LAMINATED SHIM WASHERS UNTIL THERE IS A GAP OF 0.089 - 0.105 INCH BETWEEN SLIPRING ROTOR AND STATOR** (Figure 12-86, Detail B). Measure gap opposite each slipring stator mounting bolt. One flatwasher may be removed so that 0.080 - 0.125-inch of bolt threads are visible beyond locknut. **TORQUE SLIPRING ROTOR LOCKNUTS TO 428 - 473 INCH-POUNDS, IN CRISSCROSS PATTERN.**

l. Connect slipring electrical connectors, P611, P612, P613, and P614, to tail rotor blade electrical connectors.

m. Do an operational check of blade deicing system (TM 55-1520-237-T).

12-6.35 REPLACE TAIL ROTOR SLIPRING ROTOR 12-6.35

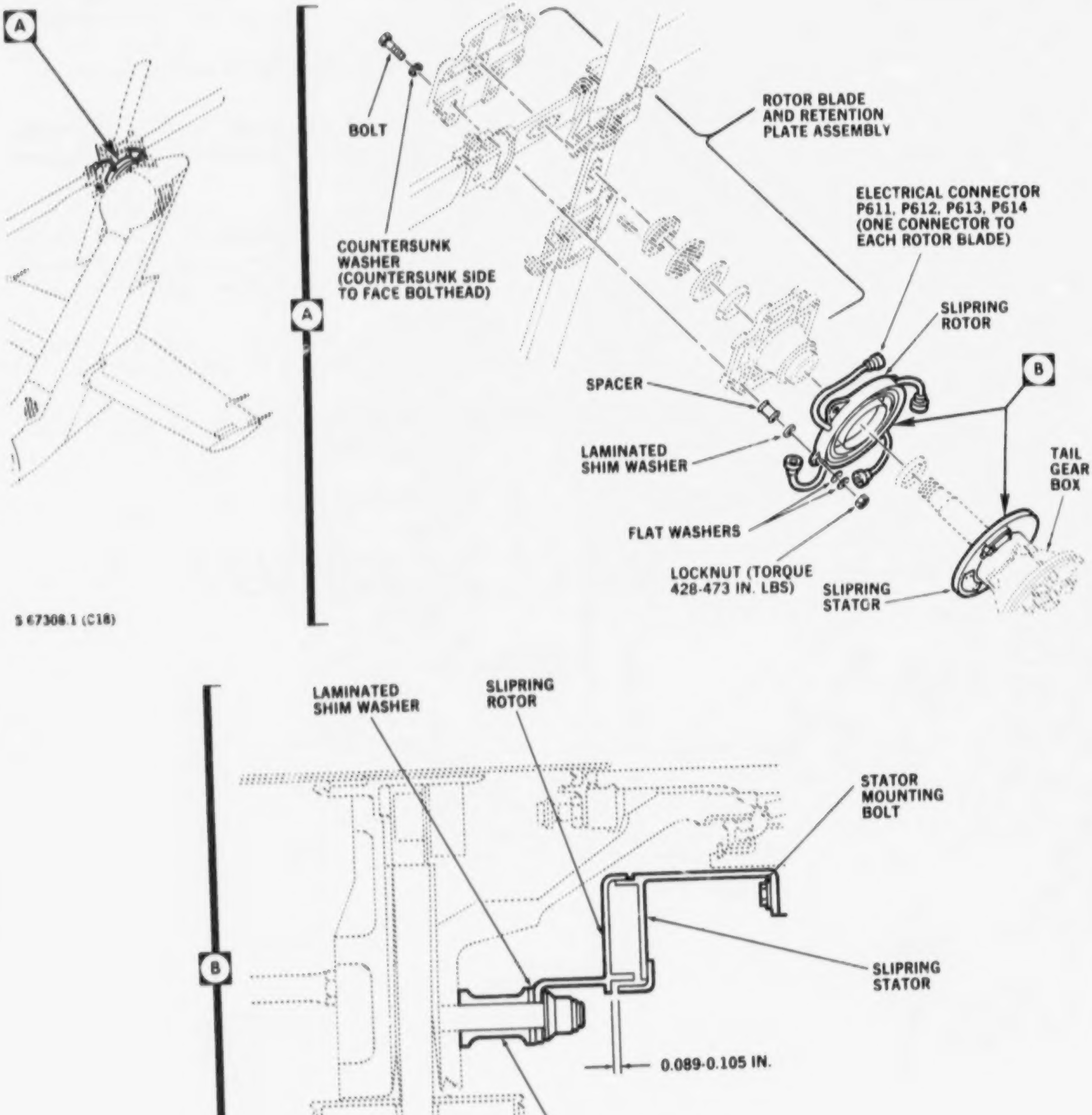

A
BOLT
COUNTERSUNK WASHER (COUNTERSUNK SIDE TO FACE BOLTHEAD)
ROTOR BLADE AND RETENTION PLATE ASSEMBLY
ELECTRICAL CONNECTOR P611, P612, P613, P614 (ONE CONNECTOR TO EACH ROTOR BLADE)
SLIPRING ROTOR
B
SPACER
LAMINATED SHIM WASHER
TAIL GEAR BOX
FLAT WASHERS
LOCKNUT (TORQUE 428-473 IN. LBS)
SLIPRING STATOR
S 67308.1 (C18)
LAMINATED SHIM WASHER
SLIPRING ROTOR
STATOR MOUNTING BOLT
SLIPRING STATOR
0.089-0.105 IN.
SPACER
S 67308.2 (C11)

FIGURE 12-86

12-6.36 REPLACE TAIL ROTOR SLIPRING STATOR 12-6.36

REMOVE

a. Turn off all electrical power.

b. Remove tail rotor slipring rotor (PARA 12-6.35).

c. Disconnect electrical connector, P327, from slipring stator brush assembly.

d. Remove mounting bolts from slipring stator.

CAUTION

To prevent surface damage and subsequent corrosion of tail gear box housing, use care in replacing slip ring stator.

e. Remove stator from tail gear box.

INSTALL

f. Turn off all electrical power.

g. Inspect tail gear box housing for nicks, scratches, and corrosion. Repair as required (PARA 6-29).

h. Position stator on tail gear box so that electrical connector, P327, reaches brush assembly electrical connector (drain hole at bottom).

i. Secure stator with bolts and washers. **TORQUE BOLTS TO 105 - 115 INCH-POUNDS.**

j. Connect electrical connector, P327, to stator brush assembly.

k. Install slipring rotor (PARA 12-6.35).

l. Do an operational check of blade deicing system (TM 55-1520-237-T).

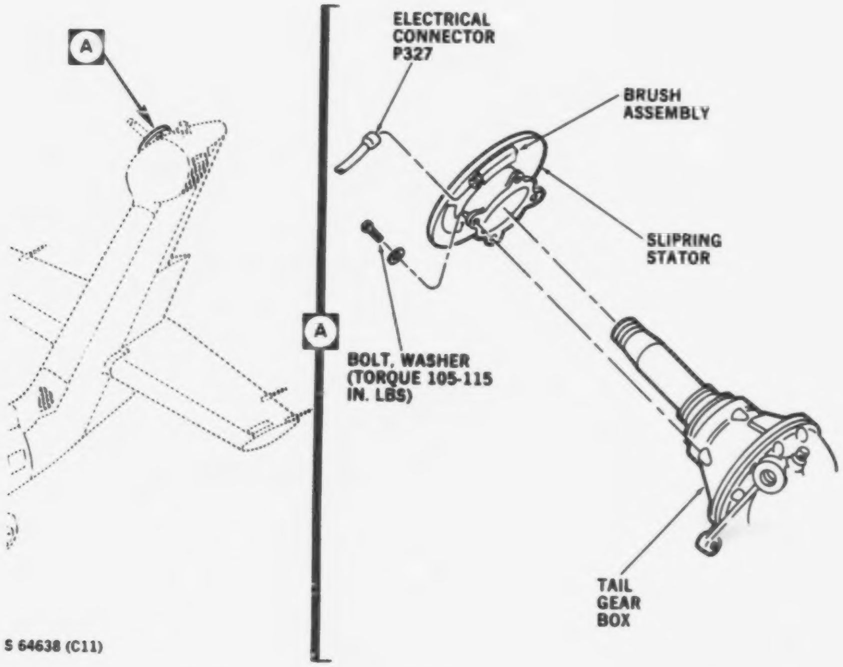

A
ELECTRICAL CONNECTOR P327
BRUSH ASSEMBLY
SLIPRING STATOR
A
BOLT, WASHER (TORQUE 105-115 IN. LBS)
TAIL GEAR BOX
S 64638 (C11)

FIGURE 12-87

12-6.37 REPLACE TAIL ROTOR STATOR BRUSH ASSEMBLY 12-6.37

REMOVE

a. Turn off all electrical power.

b. Disconnect electrical connector, P327, from brush assembly.

c. Cut lockwire from captive bolts.

d. Loosen captive bolts and remove brush assembly from tail rotor slipring assembly.

INSTALL

e. Turn off all electrical power.

NOTE

If gaskets, 287526, are damaged, use new gaskets for installation of assembly.

f. Install brush assembly using captive bolts and gaskets, 287526.

g. Lockwire, Item 198, Appendix D, captive bolts.

h. Connect electrical connector, P327, to brush assembly electrical connector.

i. Do an operational check of blade deicing system (TM 55-1520-237-T).

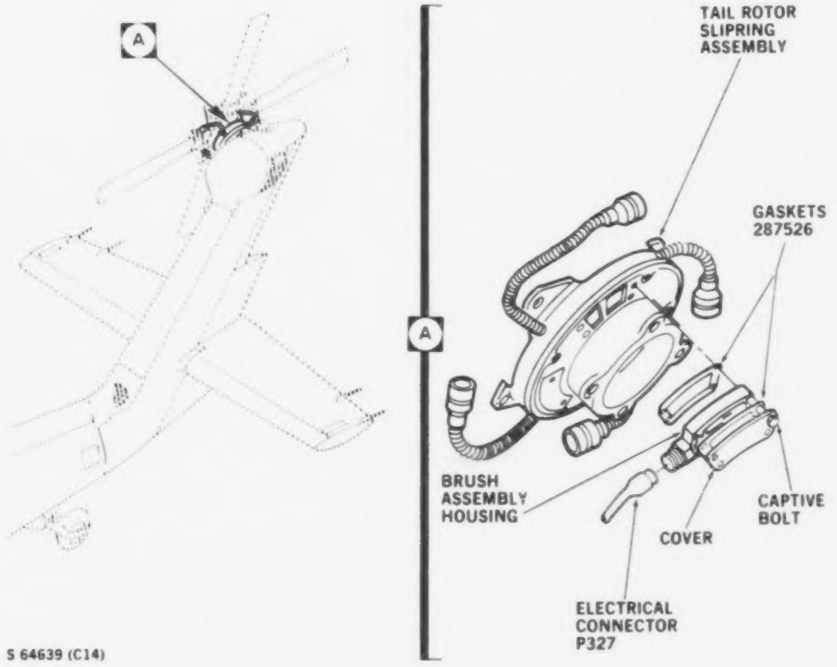

A
A
TAIL ROTOR SLIPRING ASSEMBLY
GASKETS 287526
BRUSH ASSEMBLY HOUSING
CAPTIVE BOLT
COVER
ELECTRICAL CONNECTOR P327
S 64639 (C14)

FIGURE 12-88

12-6.38 REPLACE BRUSHES/BRUSH RETAINER BOARD 12-6.38

NOTE

Replace all brush pairs. Replacement of all brush pairs is the same, except as noted.

REMOVE

a. Turn off all electrical power.

b. Remove bolts, gasket, and cover from brush assembly.

c. Remove screws holding brush retainer board to brush assembly.

d. Carefully pull brush retainer board up to get to terminal screws.

e. Tag white power wires, noting brush pair position.

f. Remove wire terminal mounting screws.

g. Unsolder brush wire terminal lugs and power wire terminal lug from spacers.

h. Carefully pull tension springs up and remove brush pairs.

i. Remove brush board assembly.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

j. Clean brush retainer board and brush assembly with methyl ethyl ketone, Item 233, Appendix D.

INSPECT

k. Inspect brush springs for wear with spring tester. **SPRING TENSION MUST BE BETWEEN 3.0 AND 3.6 POUNDS WHEN EXTENDED 0.95 INCH FROM LOWER RIVET.**

l. If spring tension is not within limits, do this:

(1) Remove retaining cement with methyl ethyl ketone, Item 233, Appendix D, cheesecloth, Item 98, Appendix D, and nonmetallic scraper. Remove brush holder from retainer board.

(2) Install brush holder in retainer board with adhesive, Item 42, Appendix D, per manufacturer's instructions.

INSTALL

m. Apply a coat of adhesive, Item 42, Appendix D, around any brush holders that are loose in brush retainer board.

n. If brush wire does not have terminal lug installed, do this:

(1) Strip insulation from end of brush wire.

(2) With crimping tool attach terminal lugs, 287529, to brush wire.

12-6.38 REPLACE BRUSHES/BRUSH RETAINER BOARD 12-6.38

CAUTION

To avoid damage to tension springs, do not apply too much pressure to springs while sliding brushes into brush holders.

o. Carefully pull tension springs up and slide brushes, 287511, into brush holders. Be sure brush wire is opposite tension spring.

p. Install brush wire terminal lug, spacer, power wire terminal lug, and spacer on brush retainer board with terminal screw. Remove tags.

q. Make sure wires do not interfere with free movement of brushes. Reposition wires as required.

r. Solder, Item 328, Appendix D, terminal lugs and spacers together.

s. Apply a coat of cement, Item 400, Appendix D, to mounting screws and terminal lugs, to prevent screws from working loose.

t. Using multimeter, check for continuity between pins of brush assembly electrical connector and each brush of brush pair.

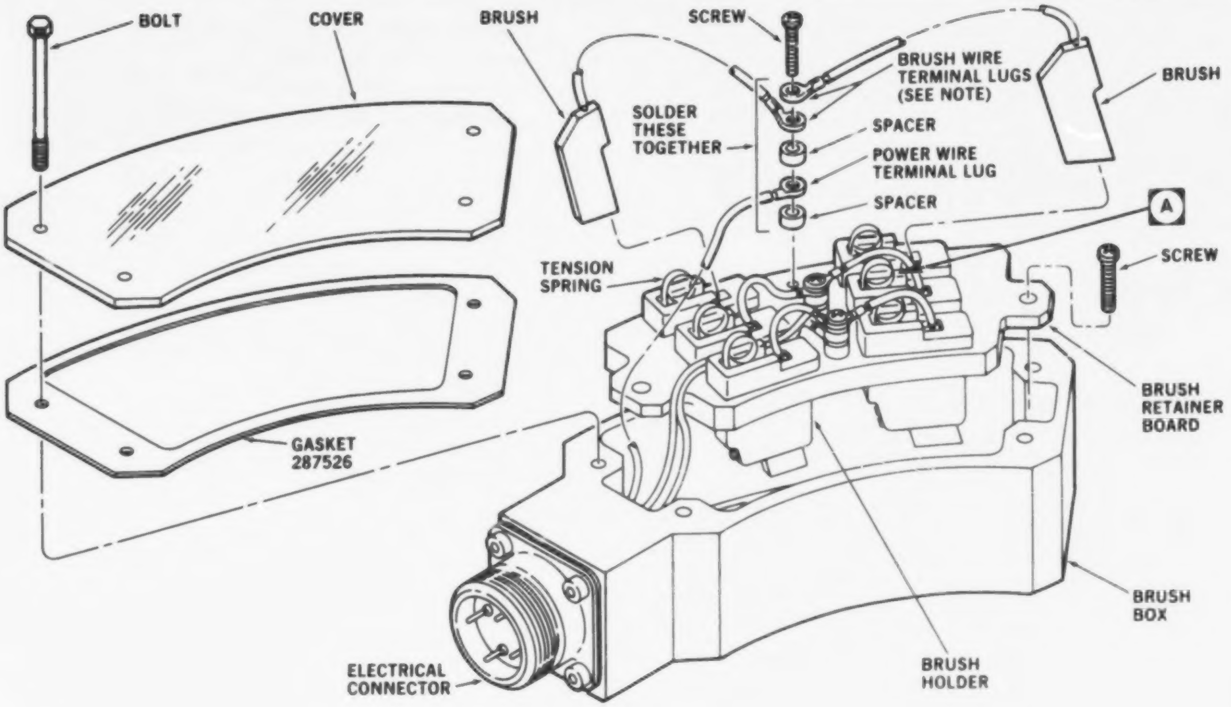
u. Using multimeter, check for infinite resistance between brush pairs.

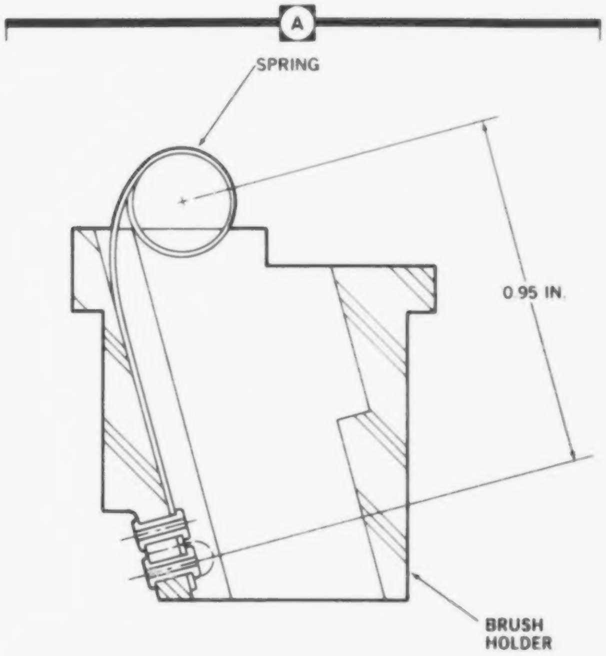
v. Position brush retainer board in brush assembly and fasten with screws.

w. Install gasket, 287526.

x. Fasten cover on brush assembly with bolts.

12-6.38 REPLACE BRUSHES/BRUSH RETAINER BOARD 12-6.38


BOLT
COVER
BRUSH
SCREW
BRUSH WIRE TERMINAL LUGS (SEE NOTE)
BRUSH
SOLDER THESE TOGETHER
SPACER
POWER WIRE TERMINAL LUG
SPACER
A
SCREW
TENSION SPRING
BRUSH RETAINER BOARD
GASKET 287526
BRUSH BOX
ELECTRICAL CONNECTOR
BRUSH HOLDER


A
SPRING
0.95 IN.
BRUSH HOLDER

NOTE

IF BRUSH WIRES DO NOT HAVE TERMINAL LUGS, USE CRIMPING TOOL TO ATTACH LUGS TO WIRES.

FIGURE 12-89

S 64643 (BH4)

12-6.39 REPLACE ELECTRICAL CONNECTOR 12-6.39

REMOVE

a. Remove screws securing electrical connector to brush assembly.

b. Using insertion/extraction tool, M81969/1404, remove and tag wires from brush assembly electrical connector.

c. Remove and inspect gasket on electrical connector. Replace gasket if damaged.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

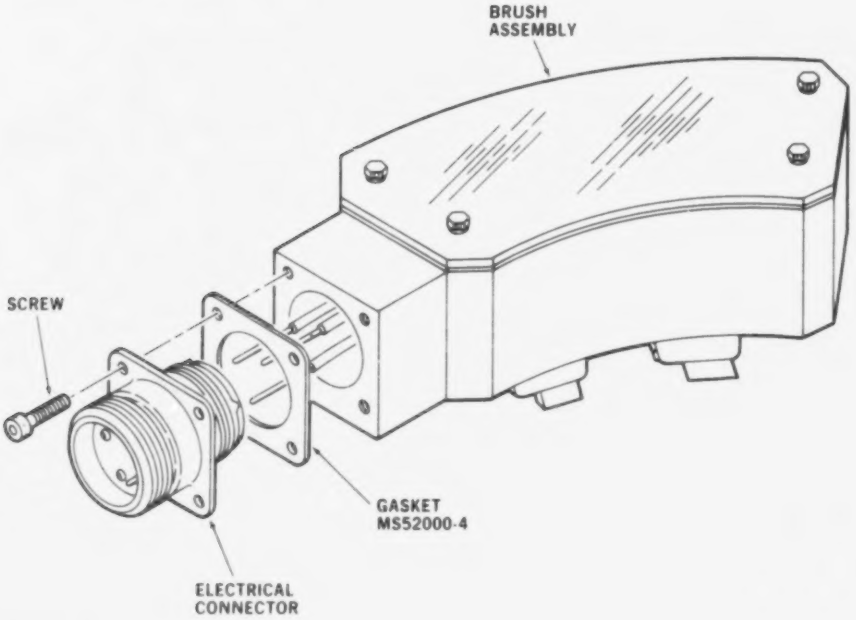
d. Clean brush assembly connector gasket surface with methyl ethyl ketone, Item 233, Appendix D.

INSTALL

e. Install gasket, MS52000-4, on electrical connector.

f. Using insertion/extraction tool, M81969/1404, insert tagged wires into electrical connector. Remove tags.

g. Install electrical connector on brush assembly with screws. Lockwire, Item 198, Appendix D.



S 84756 (C18)

FIGURE 12-90

12-6.40 REPLACE TAIL ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.40

REMOVE

a. Turn off all electrical power.

b. Remove tail rotor slipring stator (PARA 12-6.36).

INSTALL

c. Turn off all electrical power.

d. Install tail rotor slipring stator (PARA 12-6.36).

e. Do an operational check of blade deicing system (TM 55-1520-237-T).

12-6.41 INSPECT TAIL ROTOR BLADE DEICE BRUSHES/ RETAINER BOARD 12-6.41

INSPECT

a. Turn off all electrical power.

b. Visually inspect tail rotor blade deice brushes for wear.

c. If top of one or more brushes is even with brush holder, replace brushes (PARA 12-6.38).

d. If brush spring tension seems weak or brush springs are broken, replace brush retainer board (PARA 12-6.38).

e. If brush assembly cover is dirty and visual inspection cannot be done, do this:

(1) Disconnect electrical connector, P327, from brush assembly.

(2) Loosen captive bolts and remove brush assembly from tail rotor slipring assembly.

(3) Lift cover from brush assembly housing and clean cover using detergent, Item 425, Appendix D, and cold water (TM 55-1500-204-25/1).

(4) Inspect brushes for wear.

NOTE

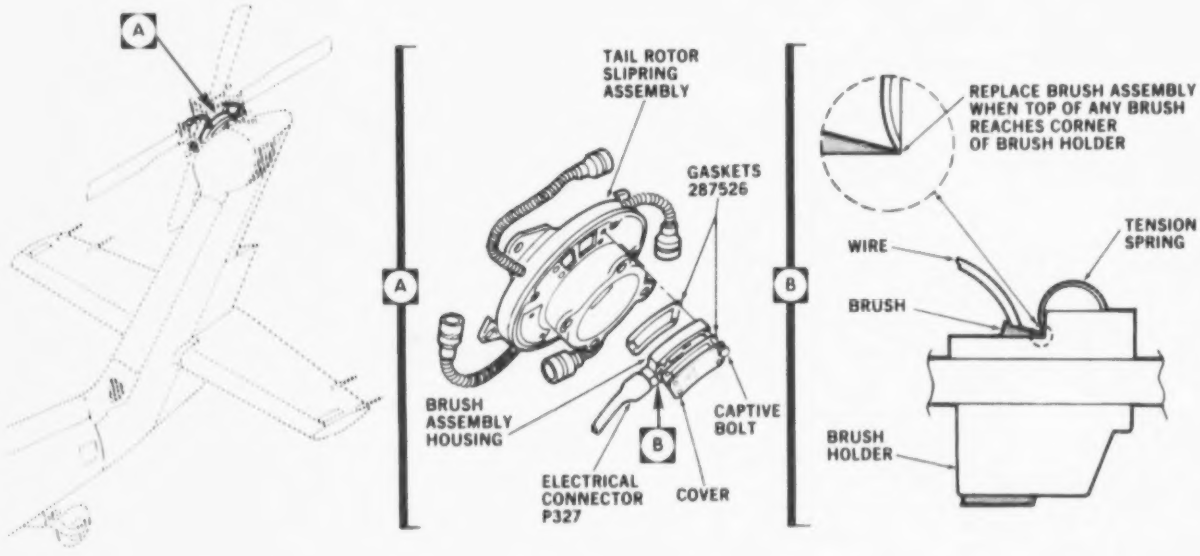
If gaskets, 287526, are damaged, use new gaskets for installation of cover and brush assembly housing.

(5) Install brush assembly using captive bolts and gaskets, 287526.

(6) Lockwire, Item 198, Appendix D, captive bolts.

(7) Connect electrical connector, P327, to brush assembly electrical connector.

f. Do an operational check of blade deicing system (TM 55-1520-237-T).


A
TAIL ROTOR SLIPRING ASSEMBLY
GASKETS 287526
A
BRUSH ASSEMBLY HOUSING
CAPTIVE BOLT
B
ELECTRICAL CONNECTOR P327
COVER
REPLACE BRUSH ASSEMBLY WHEN TOP OF ANY BRUSH REACHES CORNER OF BRUSH HOLDER
WIRE
TENSION SPRING
B
BRUSH
BRUSH HOLDER

S 64640 (C14)

FIGURE 12-91

12-6.42 CLEAN/INSPECT TAIL ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.42

CLEAN

a. Turn off all electrical power.

b. Remove slipring stator access cover.

c. Vacuum any loose debris from tail rotor assembly.

d. Slowly turn tail rotor blades while using a sash brush to clean slipring rotor. Vacuum all loose debris. Be sure drain holes at bottom of rotor and stator are free of debris.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

e. Wipe rotor clean using a clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

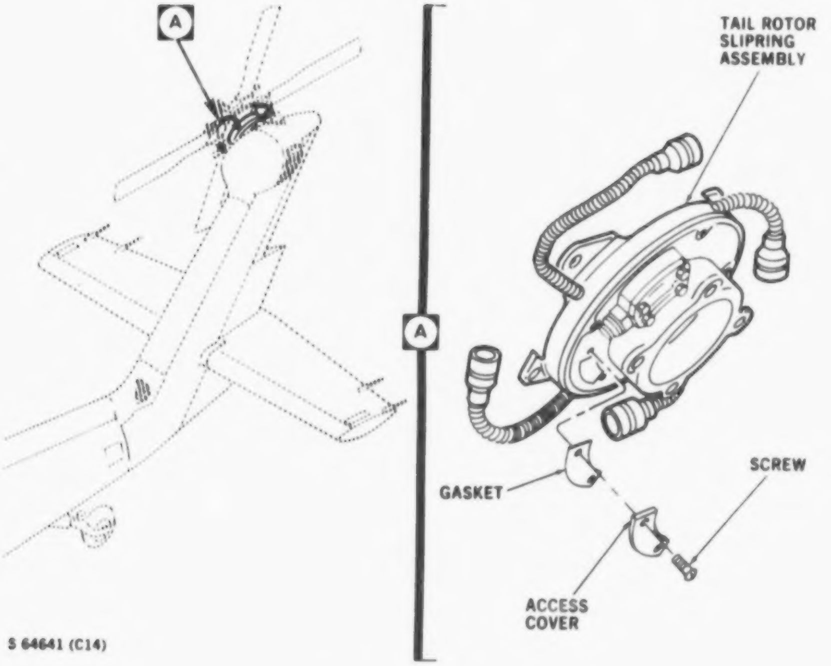


FIGURE 12-92

12-6.42 CLEAN/INSPECT TAIL ROTOR BLADE DEICE SLIPRING ASSEMBLY 12-6.42

INSPECT

f. Slowly turn tail rotor blades and inspect slipring rotor contact rings for wear. If white surface has worn through to a yellow substrate, replace slipring rotor (PARA 12-6.35).

g. Remove all access cover gasket material from access cover and stator.

h. Position access cover and gasket, 287524, on stator and secure with screws.

i. Lockwire, Item 198, Appendix D, access cover screws.

j. Do an operational check of blade deicing system (TM 55-1520-237-T).

12-7 BLADE DEICE TEST PANEL (AVIM) 12-7

PARAGRAPH BREAKDOWN

12-7.1	REPLACE ROTARY SELECTOR SWITCH (AVIM)
12-7.2	REPLACE INDICATOR LIGHT (AVIM)
12-7.3	REPLACE CONNECTOR (AVIM)
12-7.4	REPLACE PRINTED WIRING BOARD (AVIM)
12-7.5	REPLACE CIRCUIT BOARD (AVIM)
12-7.6	REPLACE WIRING BOARD AND CIRCUIT BOARD COMPONENTS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68F - Aircraft Electrical Repairer

MATERIALS/PARTS

- Insulation Compound, Item 177, Appendix D
- Solder, Item 328, Appendix D

TOOLS

- Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Insert/Extract Tool, MS3447-18
- Soldering Set, TL905U
- Tags

REFERENCES

- TM 55-1520-237-T

12-7.1 REPLACE ROTARY SELECTOR SWITCH (AVIM) 12-7.1

REMOVE

a. Make sure electrical power is removed from test panel.

b. Remove information plate from test panel (PARA 12-6.30).

c. Remove screws and remove bottom cover from test panel.

d. Tag and unsolder wiring from switch.

e. Remove nut, washer, and lockwasher, and remove switch from test panel.

INSTALL

f. Make sure electrical power is removed from test panel.

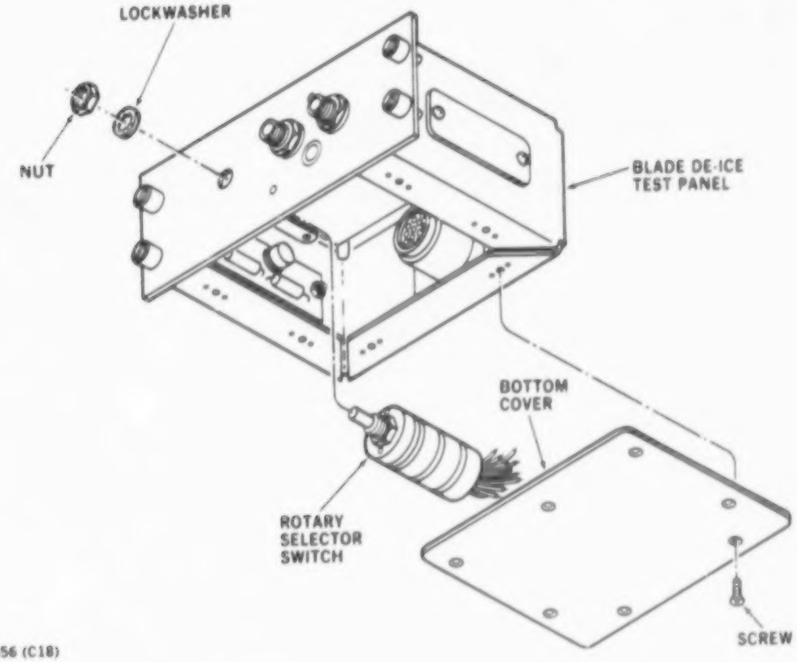
g. Place switch through opening in front of test panel and fasten with nut, washer, and lockwasher.

h. Solder, Item 328, Appendix D, wiring to switch, and remove tags.

i. Fasten bottom cover to test panel with screws.

j. Install information plate on test panel (PARA 12-6.30).

k. Do a blade deice test panel operational check (TM 55-1520-237-T).



S 79656 (C18)

FIGURE 12-93

12-7.2 REPLACE INDICATOR LIGHT (AVIM) 12-7.2

NOTE

Blade deice test panel has two indicator lights. Replacement of both is the same.

REMOVE

a. Turn off all electrical power.

b. Remove information plate from test panel (PARA 12-6.30).

c. Remove screws and remove bottom cover from test panel.

d. Unsolder and tag wiring to indicator light.

e. Remove nut and washer, and remove indicator light from panel.

INSTALL

f. Turn off all electrical power.

g. Place indicator light through opening in front of test panel and fasten with nut and washer.

h. Solder, Item 328, Appendix D, wiring to indicator light and remove tags.

i. Fasten bottom cover to test panel with screws.

j. Install information plate to test panel (PARA 12-6.30).

k. Do a blade deice test panel operational check (TM 55-1520-237-T).

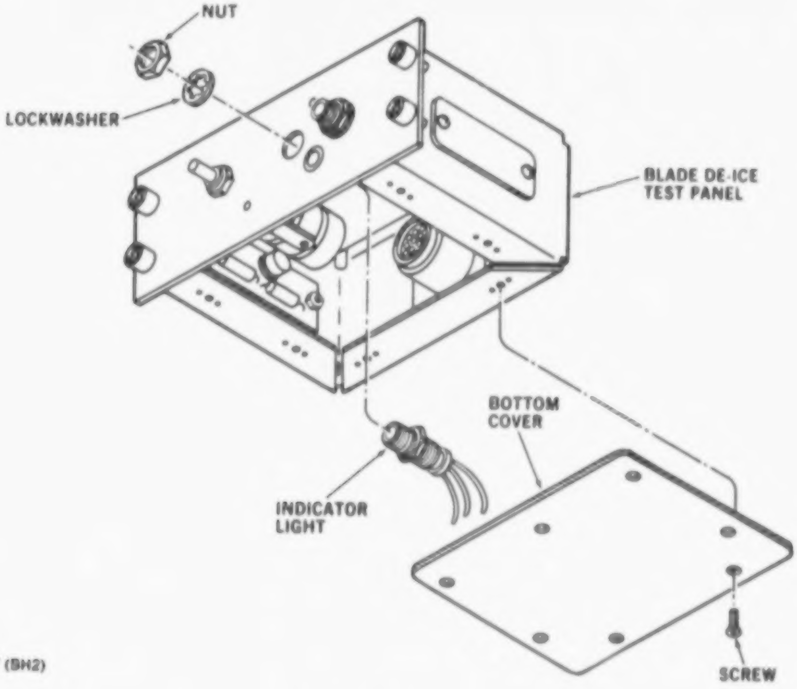


FIGURE 12-94

12-7.3 REPLACE CONNECTOR (AVIM) 12-7.3

REMOVE

a. Turn off all electrical power.

b. Remove screws and remove bottom cover from test panel.

c. Remove screws, washers, lockwashers, and nuts securing electrical connector and ground wire to test panel.

d. Tag wires to connector.

e. Using insert/extract tool, MS3447-18, remove pins from connector.

INSTALL

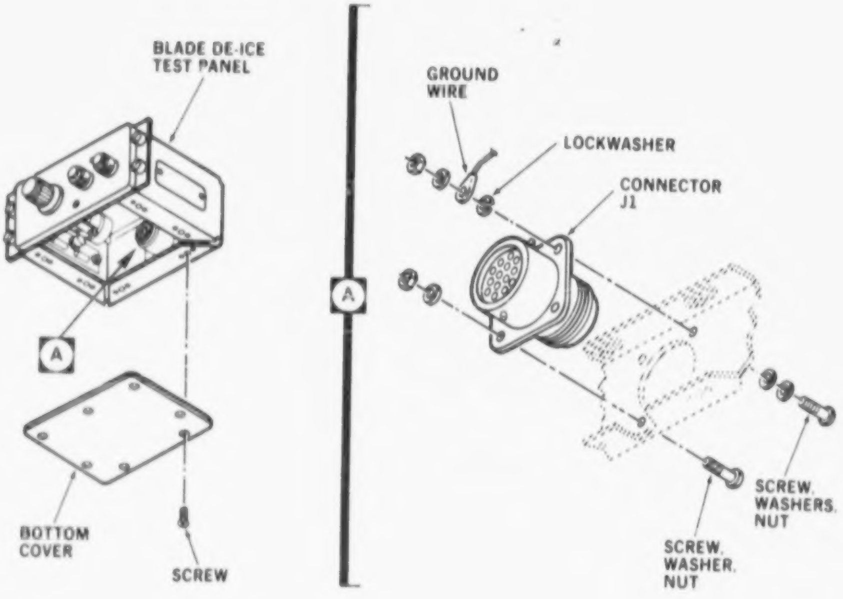
f. Turn off all electrical power.

g. Using insert/extract tool, MS3447-18, insert tagged wires into connector. Remove tags.

h. Install connector and ground wire to test panel with screws, washers, lockwashers, and nuts.

i. Install bottom cover to test panel and fasten with screws.

j. Do a blade deice test panel AVIM operational check (TM 55-1520-237-T).


BLADE DE-ICE TEST PANEL
A
BOTTOM COVER
SCREW
A
GROUND WIRE
LOCKWASHER
CONNECTOR J1
SCREW, WASHERS, NUT
SCREW, WASHER, NUT

S 79658 (C18)

FIGURE 12-95

12-7.4 REPLACE PRINTED WIRING BOARD (AVIM) 12-7.4

REMOVE

a. Make sure electrical power is removed from test panel.

b. Remove screws securing top and bottom covers to test panel, and remove both covers.

c. Remove screws securing connector, J2, to connector, P2, on printed wiring board.

d. Disconnect connector, P2, from connector, J2.

e. Remove screws securing deck assembly to test panel, and slide deck assembly away from test panel.

f. Tag and unsolder four wires connecting printed wiring board to circuit board.

g. Tag wires to connector, J1.

h. Unsolder all wires from printed wiring board connecting to connector, J1.

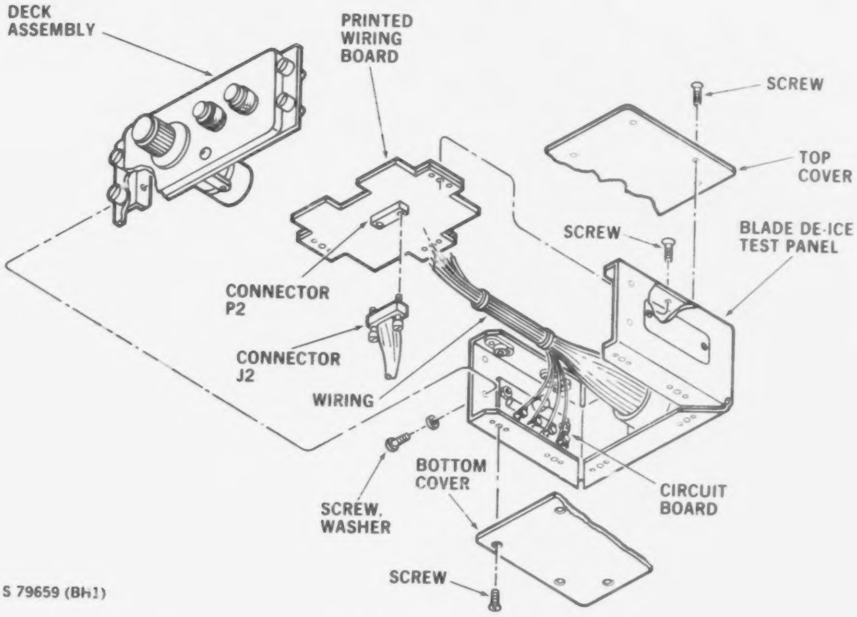

DECK ASSEMBLY
PRINTED WIRING BOARD
SCREW
TOP COVER
SCREW
BLADE DE-ICE TEST PANEL
CONNECTOR P2
CONNECTOR J2
WIRING
BOTTOM COVER
CIRCUIT BOARD
SCREW, WASHER
SCREW
S 79659 (BH1)

FIGURE 12-96

12-7.4 REPLACE PRINTED WIRING BOARD (AVIM) 12-7.4

i. Remove screws securing printed wiring board to test panel.

j. Remove printed wiring board from test panel.

INSTALL

k. Turn off all electrical power.

l. Install printed wiring board in test panel using screws.

m. Solder, Item 328, Appendix D, four wires connecting printed wiring board to circuit board and remove tags.

n. Solder, Item 328, Appendix D, all wires connecting printed wiring board to connector, J1. Remove tags.

o. Join connector, J2, to connector, P2, and tighten screws.

p. Install deck assembly to test panel with screws.

q. Install top and bottom covers with screws.

r. Do a blade deice test panel operational check (TM 55-1520-237-T).

12-7.5 REPLACE CIRCUIT BOARD (AVIM) 12-7.5

REMOVE

a. Turn off all electrical power.

b. Remove screws and bottom cover from test panel.

c. Tag and unsolder four wires from printed wiring board connected to circuit board.

d. Remove screws, washers, spacers, and nuts securing circuit board to test panel.

e. Remove circuit board.

REPLACE

f. Turn off all electrical power.

g. Install screws, washers, spacers, and nuts securing circuit board to test panel.

h. Solder, Item 328, Appendix D, four wires to printed wiring board leading from circuit board. Remove tags.

i. Secure bottom panel to test panel with screws.

j. Do a blade deice test panel AVIM operational check (TM 55-1520-237-T).

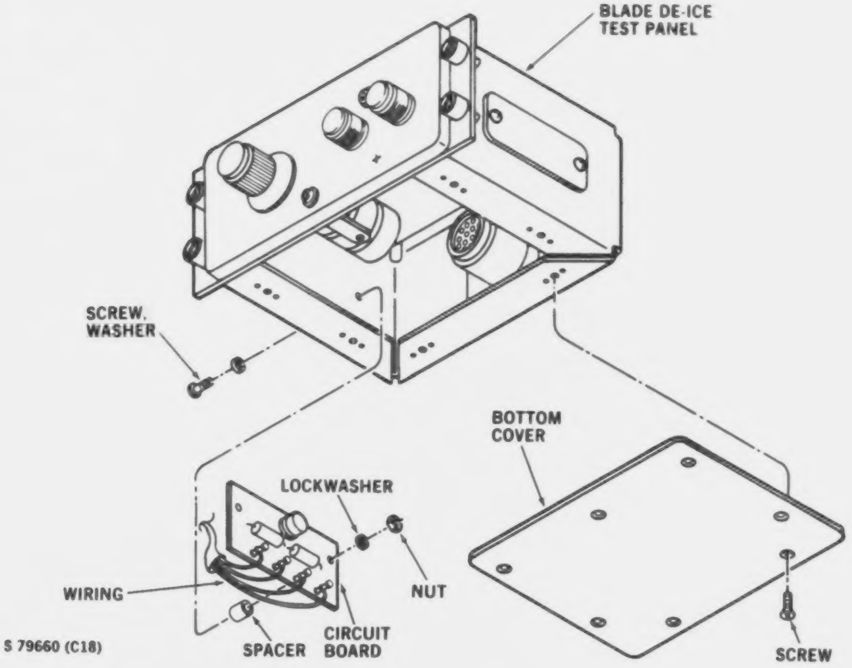

BLADE DE-ICE TEST PANEL
SCREW, WASHER
BOTTOM COVER
LOCKWASHER
WIRING
NUT
S 79660 (C18)
SPACER
CIRCUIT BOARD
SCREW

FIGURE 12-97

12-7.6 REPLACE CIRCUIT BOARD (AVIM) 12-7.6

NOTE

If replacing printed wiring board components, remove printed wiring board (PARA 12-7.4). If replacing circuit board components, remove circuit board (PARA 12-7.5).

REMOVE

a. Unsolder component leads by heating each lead and removing solder with solder-removing device.

CAUTION

When removing components with positive and negative termination points, note the position of the component and its leads before removal.

b. Remove component from circuit board/wiring board.

INSTALL

CAUTION

- Too much heat during soldering will cause damage to components and printed circuit.
- Make certain that components with positive and negative termination points are positioned and installed correctly, such as C1 through C4.

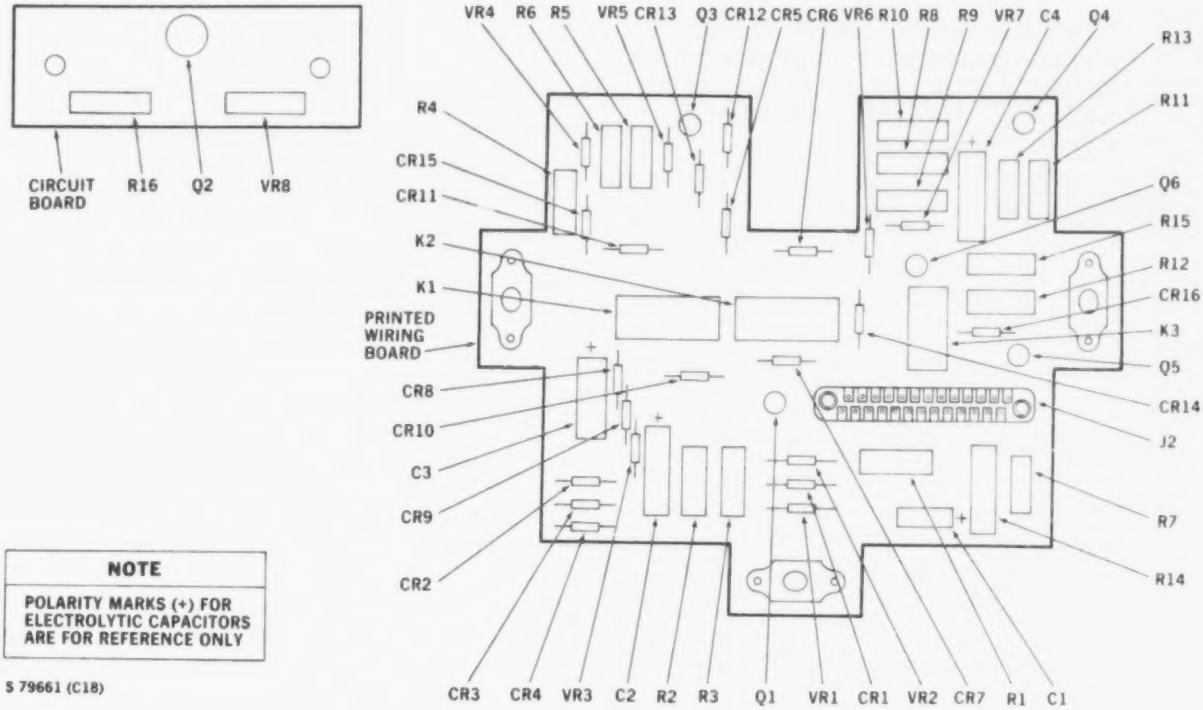
c. Install replacement part on circuit board/wiring board and solder, Item 328, Appendix D, leads to board.

d. Apply insulation compound, Item 177, Appendix D, to replacement part and leads.

e. Install circuit board and/or printed wiring board in blade deice test panel, (PARA 12-7.4) for wiring board and (PARA 12-7.5) for circuit board.

f. Do a blade deice test panel operational check (TM 55-1520-237-T).

12-7.6 REPLACE CIRCUIT BOARD (AVIM) 12-7.6


CIRCUIT BOARD
R16
Q2
VR8
VR4
R6
R5
VR5
CR13
Q3
CR12
CR5
CR6
VR6
R10
R8
R9
VR7
C4
Q4
R13
R11
Q6
R15
R12
CR16
K3
Q5
CR14
J2
R7
R14
R4
CR15
CR11
K2
K1
PRINTED WIRING BOARD
CR8
CR10
C3
CR9
CR2
CR3
CR4
VR3
C2
R2
R3
Q1
VR1
CR1
VR2
CR7
R1
C1

NOTE

POLARITY MARKS (+) FOR ELECTROLYTIC CAPACITORS ARE FOR REFERENCE ONLY

S 79661 (C18)

FIGURE 12-98

CHAPTER 13

ENVIRONMENTAL CONTROL SYSTEMS

CHAPTER OVERVIEW

PARAGRAPH	TITLE	PAGE
13-1	Heating and Ventilating System	13-2
13-2	Heating and Ventilation System-Repair	13-24
13-3	Heating and Ventilating Blower	13-35
13-4	Blower Unit-Repair (AVIM)	13-38
13-5	Environmental Control System	13-41
13-6	Environmental Control System-Repair (AVIM)	13-55
13-7	Environmental Control Electrical System	13-89
13-8	ECS Pressure Switches	13-95

13-1 HEATING AND VENTILATING SYSTEM 13-1

PARAGRAPH BREAKDOWN

13-1.1 REPLACE MIXING VALVE 79089-2
13-1.2 REPLACE MIXING VALVE 3224634-1
13-1.3 REPLACE TEMPERATURE TUBES
13-1.4 REPLACE BLEED-AIR TUBE
13-1.5 REPLACE MIXTURE TEMPERATURE SENSOR
13-1.6 REPLACE AIR OUTLETS
13-1.7 REPLACE HEATER CONTROL SHAFT
13-1.8 REPLACE HEATER CONTROL ADAPTER
13-1.9 REPLACE MUFFLER ASSEMBLY
13-1.10 REPLACE COCKPIT DOOR DUCTS

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant
- One: MOS 68G - Aircraft Structural Repairer

MATERIALS/PARTS

- Adhesive, Item 57, Appendix D
- Antiseize Compound, Item 78, Appendix D
- Coupling Tube, 70306-02115-102
- Degreasing Solvent, Item 131, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Packing, MS9068-013
- Packing, MS28778-4
- Petrolatum, Item 259, Appendix D
- Rivets, NAS1739B6-5
- Seals, 70309-02113-101
- Sealing Compound, Item 312, Appendix D
- Tape, insulation, Item 342, Appendix D
- Thermal Insulation, 70309-02108-101

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Airframe Repairer's Toolkit, SS5180-99-CL-A02
- Blind Rivet Gun Kit, 353-51
- Drill Bit, No. 16, GGG-D-00751
- Hand or Pneumatic Drill, OO-D-691
- Nonmetallic Scraper, Locally-Made
- Protective Caps and Plugs
- Torque Wrench, 30 - 150 in. lbs., GGG-W-00686

REFERENCES

- PARA 2-3
- PARA 2-32
- PARA 11-23
- TM 55-1520-237-T

13-1.1 REPLACE MIXING VALVE 79089-2 13-1.1

NOTE

Replacement procedures in this paragraph are applicable to helicopters serial Nos 77-22714 through 77-22716, and serial Nos 77-22719 through 77-22726, which have mixing valve, 79089-2 installed.

REMOVE

a. Turn off all electrical power.

b. Open main rotor pylon sliding fairing.

c. Loosen clamps that fasten couplings to mixing valve inlet and outlet ports.

d. Disconnect electrical connector from mixing valve.

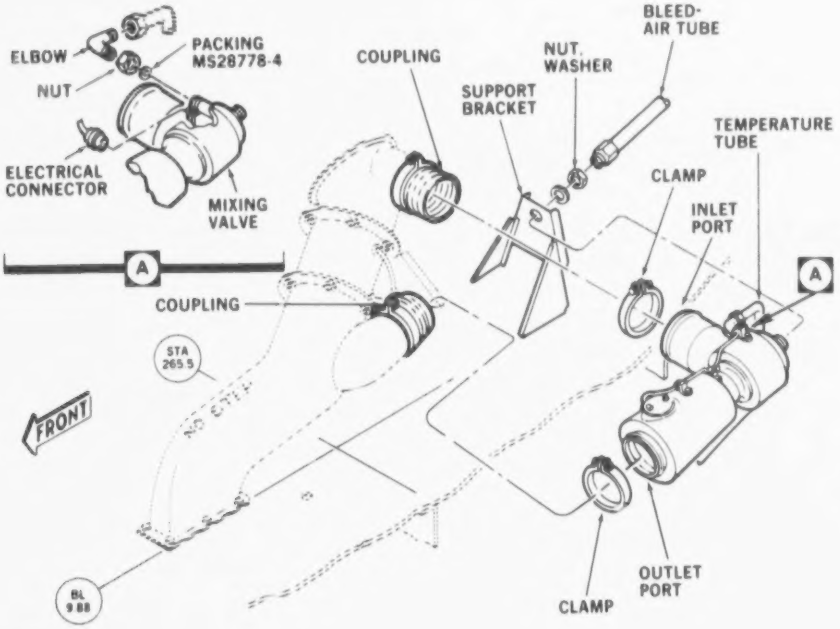
e. Disconnect temperature tube from elbow in mixing valve.

f. Disconnect bleed-air tube from mixing valve.

g. Remove nut and washer fastening mixing valve to support bracket.

h. Slide mixing valve forward and carefully remove valve from support bracket and couplings.

i. If mixing valve is being replaced, remove elbow, nut, and packing from mixing valve.


ELBOW
PACKING MS28778-4
NUT
ELECTRICAL CONNECTOR
MIXING VALVE
A
COUPLING
COUPLING
STA 265.5
FRONT
BL 9.88
SUPPORT BRACKET
NUT, WASHER
BLEED-AIR TUBE
TEMPERATURE TUBE
CLAMP
INLET PORT
A
OUTLET PORT
CLAMP

S 46268 (C8)

FIGURE 13-1

13-1.1 REPLACE MIXING VALVE 79089-2 13-1.1

INSTALL

j. Turn off all electrical power.

k. If removed, install elbow, nut, and packing MS28778-4, on mixing valve.

l. Carefully position mixing valve in support bracket and install couplings on valve.

m. Install mixing valve on support bracket with washer and nut.

n. Connect bleed-air tube to mixing valve.

o. Connect electrical connector to mixing valve.

p. Connect temperature tube to mixing valve.

q. Make sure couplings are properly positioned over inlet and outlet ports of mixing valve and tighten clamps.

r. Make sure area is free of foreign objects before closing up.

s. Check heating/ventilating system operation (TM 55-1520-237-T). Check all mixing valve connections for leaks.

t. Make sure area is free of foreign objects before closing up.

u. Close main rotor pylon sliding fairing.

13-1.2 REPLACE MIXING VALVE 3224634-1 13-1.2

REMOVE

NOTE

Replacement procedures in this paragraph are applicable to helicopters serial Nos 77-22717 and 77-22718 and serial Nos 77-22727 and subsequent, which have mixing valve 3224634-1 installed.

a. Turn off all electrical power.

b. Open main rotor pylon sliding cover.

c. Disconnect electrical connector from mixing valve.

d. Loosen clamps that fasten couplings to valve inlet and outlet ports.

e. Disconnect temperature sensing tube from elbow on valve.

f. Loosen clamps and remove tube coupling to disconnect air tube from valve.

g. Remove bolts and washers securing valve to support bracket. Remove valve.

h. If valve is being replaced, remove elbow, nut, and packing from it.

INSTALL

i. Turn off all electrical power.

j. If removed, install elbow, nut, and packing MS28778-4, on mixing valve.

k. Install mixing valve on support bracket with bolts and washers. **TORQUE TO 47 - 53 INCH-POUNDS.**

l. Connect bleed-air tube to valve with tube coupling and clamps. **TORQUE CLAMPS TO 40 - 45 INCH-POUNDS.**

NOTE

Leave 0.13-inch gap between bleed-air tube and mixing valve.

m. Connect temperature sensing tube to elbow on valve.

n. Make sure couplings are properly positioned over inlet and outlet ports of mixing valve. Tighten clamps.

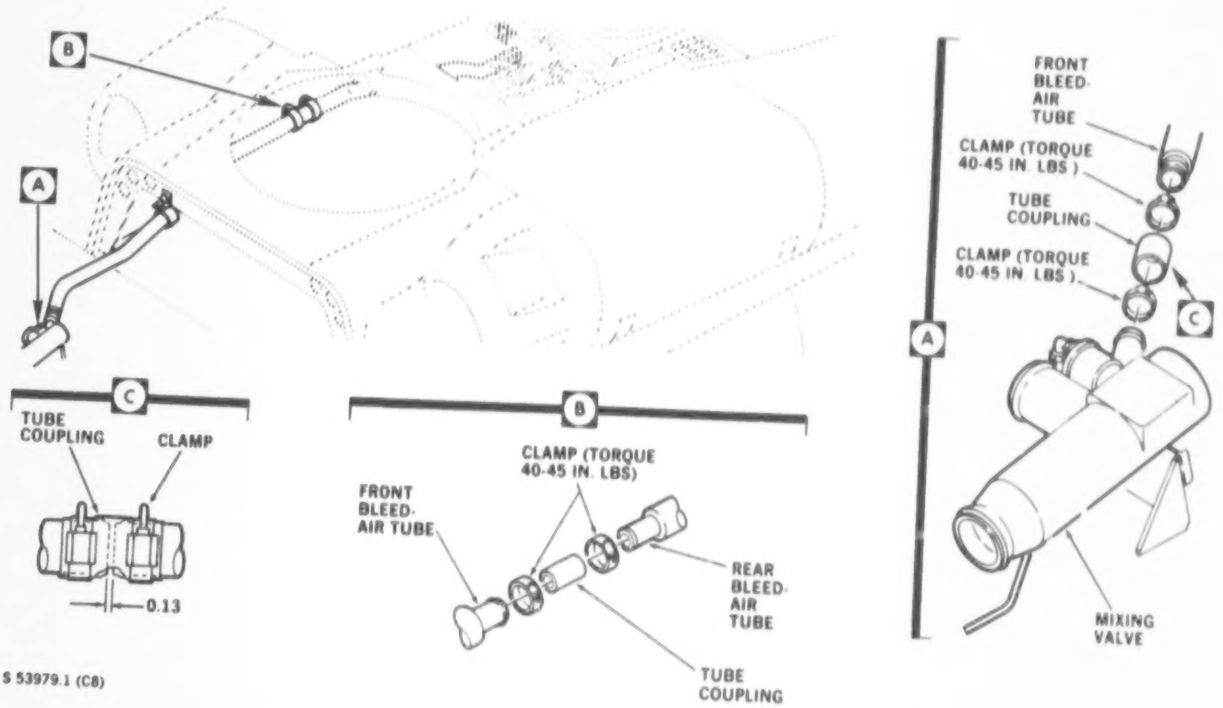
o. Connect electrical connector to valve.

p. Make sure area is free of foreign objects before closing up.

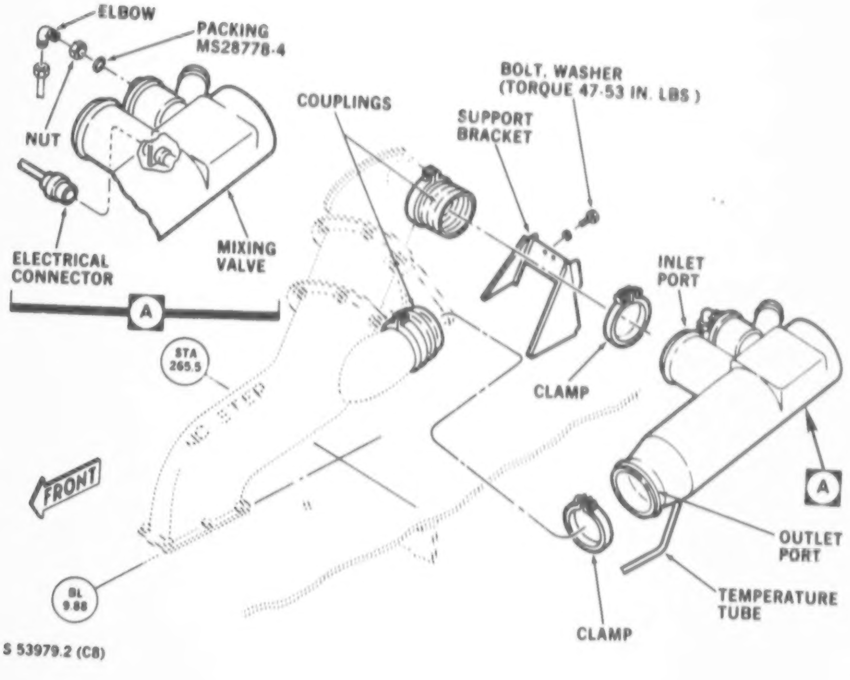
q. Check heating and ventilation system operation (TM 55-1520-237-T). Check all valve connections for leaks.

r. Close main rotor pylon sliding cover.

13-1.2 REPLACE MIXING VALVE 3224634-1 13-1.2


B
A
C
TUBE COUPLING
CLAMP
0.13
B
CLAMP (TORQUE 40-45 IN. LBS)
FRONT BLEED-AIR TUBE
REAR BLEED-AIR TUBE
TUBE COUPLING
FRONT BLEED-AIR TUBE
CLAMP (TORQUE 40-45 IN. LBS.)
TUBE COUPLING
CLAMP (TORQUE 40-45 IN. LBS.)
C
A
MIXING VALVE

S 53979.1 (C8)


ELBOW
PACKING MS28778-4
NUT
ELECTRICAL CONNECTOR
MIXING VALVE
A
COUPLINGS
SUPPORT BRACKET
BOLT, WASHER (TORQUE 47-53 IN. LBS.)
INLET PORT
CLAMP
STA 265.5
FRONT
A
OUTLET PORT
TEMPERATURE TUBE
BL 9.88
CLAMP

S 53979.2 (C8)

FIGURE 13-2

13-1.3 REPLACE TEMPERATURE TUBES 13-1.3

REMOVE UPPER TUBE

a. Turn off all electrical power.

b. Open main rotor pylon sliding fairing.

c. Disconnect upper tube from elbow on mixing valve.

d. Disconnect tube from elbow on cabin skin.

e. Unclamp tube from frame and remove from helicopter. Remove clamp, screw, nut, and spacer.

f. If necessary to remove elbow, disconnect lower tube from elbow in cabin overhead (PARA 13-1.4). Remove nut and washer, remove elbow and sealing washers from cabin skin. Remove sealing washers from elbow.

INSTALL UPPER TUBE

g. Turn off all electrical power.

h. If removed, install two sealing washers on elbow. Install elbow in cabin skin and install washer and nut from inside cabin. Do not tighten nut now.

i. Connect upper tube to elbow on deck and elbow on mixing valve.

j. Tighten bulkhead nut on elbow. Connect lower tube.

k. Install clamp on tube. Install spacer on frame. Fasten clamp to frame with screw and nut.

l. **TORQUE UPPER AND LOWER TUBING FLARE NUTS TO 50 - 65 INCH-POUNDS.**

m. Wipe top side of elbow installation with cloth soaked with degreasing solvent, Item 131, Appendix D. Wipe dry with a clean cloth.

n. Apply sealing compound, Item 312, Appendix D, around top of elbow where it passes through deck. Wipe off excess sealant.

o. Check heating/ventilating system operation (TM 55-1520-237-T). Check tube connections for leaks.

p. Make sure area is free of foreign objects before closing up.

q. Close main rotor pylon sliding fairing.

REMOVE LOWER TUBE

r. Remove soundproofing from station 247 to station 265 in cabin overhead (PARA 2-32).

CAUTION

Make sure rod length on adjustable control rods is not changed.

s. Disconnect and remove both cyclic control rods, and yaw control rod, to get lower temperature tube (PARA 11-23).

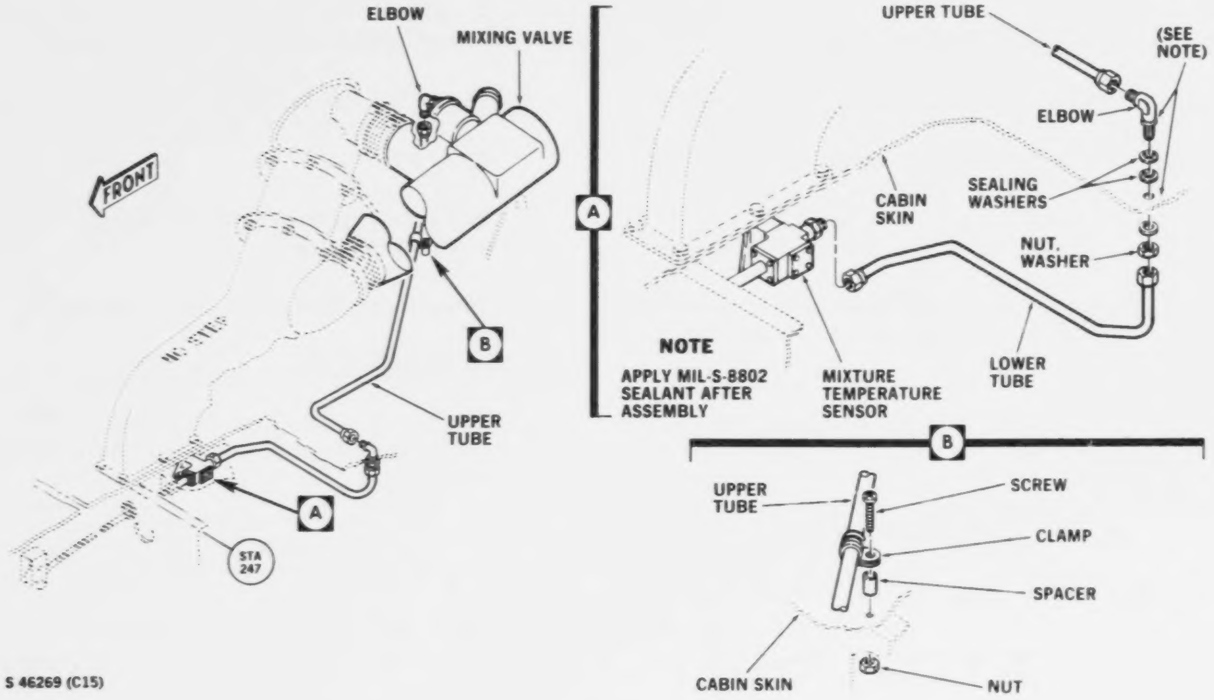
t. Disconnect lower tube from elbow in overhead cabin and from union on mixture temperature sensor.

u. If necessary to remove elbow, disconnect upper temperature tube from elbow. In cabin overhead remove nut and washer, remove elbow and sealing washers. Remove sealing washers from elbow.

INSTALL LOWER TUBE

v. If removed, install two sealing washers on elbow. Install elbow in cabin skin and install washer and nut from inside cabin. Do not tighten nut now.

13-1.3 REPLACE TEMPERATURE TUBES 13-1.3


ELBOW
MIXING VALVE
FRONT
A
B
UPPER TUBE
STA 247
S 46269 (C15)
A
UPPER TUBE
(SEE NOTE)
ELBOW
CABIN SKIN
SEALING WASHERS
NUT, WASHER
LOWER TUBE
MIXTURE TEMPERATURE SENSOR
B
UPPER TUBE
SCREW
CLAMP
SPACER
CABIN SKIN
NUT

NOTE

APPLY MIL-S-8802 SEALANT AFTER ASSEMBLY

FIGURE 13-3

w. Connect upper tube to elbow. Tighten nut on elbow.

x. Connect lower tube to elbow in overhead cabin and to union on mixture temperature sensor.

y. Reinstall two cyclic control rods and yaw control rod (PARA 11-23).

z. Check heating/ventilating system operation (TM 55-1520-237-T). Check tube connections for leaks.

aa. Make sure area is free of foreign objects before closing up.

ab. Reinstall soundproofing (PARA 2-32).

13-1.4 REPLACE BLEED-AIR TUBE 13-1.4

REMOVE

a. Turn off all electrical power.

b. Unlatch and open main rotor pylon sliding fairing and oil cooler compartment access doors.

c. On helicopters serial Nos 77-22714 through 77-22716 and serial Nos 77-22719 through 77-22726, disconnect front bleed-air tube from mixing valve.

d. On helicopters serials Nos 77-22717 and 77-22718 and serial Nos 77-22727 and subsequent, disconnect bleed-air tube from mixing valve by unclamping and removing tube coupling. Discard tube coupling.

e. On forward main rotor pylon, station 314, unclamp tube from support clamp.

f. On helicopters serial Nos 83-23838 and subsequent, do this:

(1) Loosen clamps on left and right bleed-air lines (Figure 13-4, Sheet 2).

(2) Disconnect bleed-air lines from tee in front bleed-air tube. Gently flex bleed-air lines over cone of tee.

(3) Remove tee from front bleed-air tube. Remove packing and jamnut from tee. Cap or plug tee.

(4) Unclamp bleed-air tube from bracket on channel at WL 283.

INSPECT

g. Replace tubing if dents and distortion in tubes is over 25% of tube diameter.

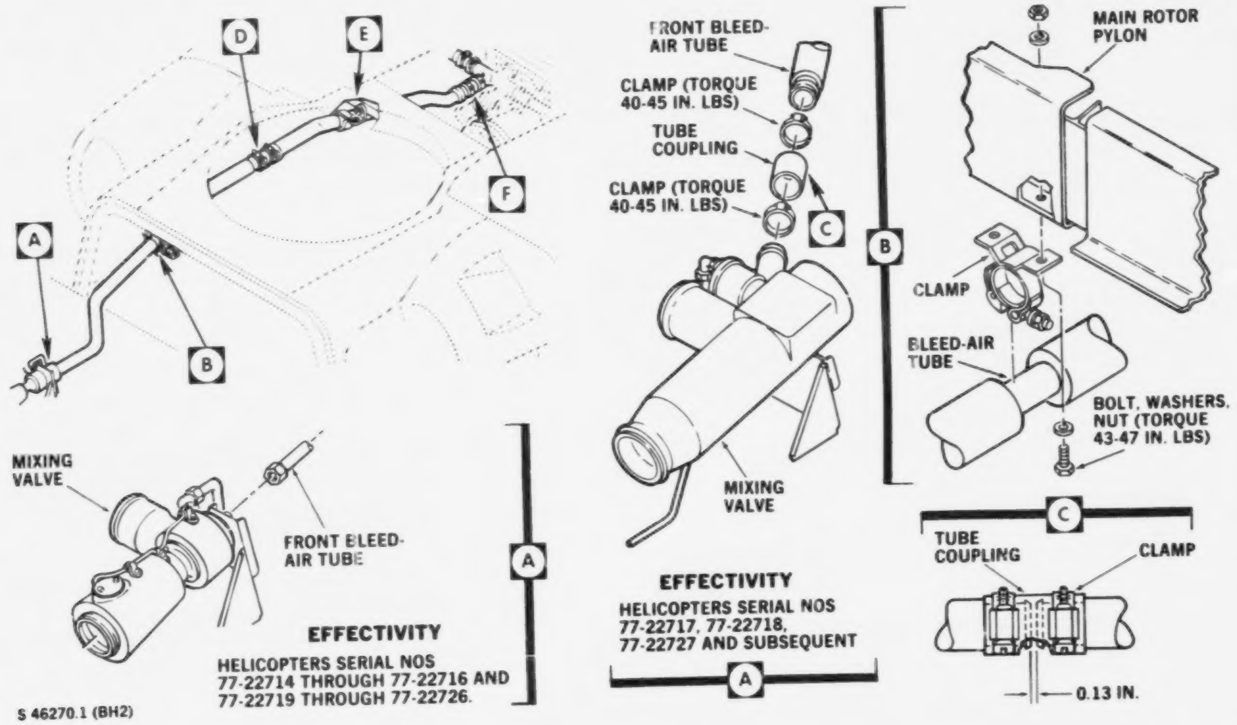

D
E
F
A
B
MIXING VALVE
FRONT BLEED-AIR TUBE
A
EFFECTIVITY
HELICOPTERS SERIAL NOS 77-22714 THROUGH 77-22716 AND 77-22719 THROUGH 77-22726.
S 46270.1 (BH2)
FRONT BLEED-AIR TUBE
CLAMP (TORQUE 40-45 IN. LBS)
TUBE COUPLING
CLAMP (TORQUE 40-45 IN. LBS)
C
MIXING VALVE
EFFECTIVITY
HELICOPTERS SERIAL NOS 77-22717, 77-22718, 77-22727 AND SUBSEQUENT
A
B
MAIN ROTOR PYLON
CLAMP
BLEED-AIR TUBE
BOLT, WASHERS, NUT (TORQUE 43-47 IN. LBS)
C
TUBE COUPLING
CLAMP
0.13 IN.

FIGURE 13-4 (SHEET 1 OF 2)

best copy available

13-1.4 REPLACE BLEED-AIR TUBE 13-1.4

h. Check brackets for cracks, bending, and security.

i. Inspect bleed-air tubing insulation for breaks and tears. Repair or replace if damaged.

REPAIR TUBE INSULATION

j. Repair minor breaks or tears in insulation, using insulation tape, Item 342, Appendix D. Do not compress insulation when wrapping tube.

k. To installation new thermal insulation, do this:

  (1) Remove all old insulation from tube.

  (2) Cut wedges out of new insulation, as required, to fit insulation over tube bends.

  (3) Tape all seams with insulation tape, Item 342, Appendix D, being careful not to compress insulation.

  (4) Apply a full wrap (about 1-1/2 turns) of tape at each end of insulation, and at one-foot intervals.

l. In transmission area, station 346, unclamp and remove tube coupling which connects front and rear tubes. Throw tube coupling away.

m. Slide front tube forward and out of helicopter.

n. Unclamp and remove tube coupling connecting rear tube to pneumatic manifold. Remove rear tube from helicopter. Throw tube coupling away.

o. Cap or plug all tubing and manifolds.

INSTALL

p. Turn off all electrical power.

q. Uncap or unplug tubing, tee, and mixing valve ports.

r. Blow all tubes and mixing valve ports with filtered, dry compressed air.

s. Slide replacement rear bleed-air tube into position.

t. Connect rear tube to pneumatic manifold with replacement tube coupling, 70306-02115-102, and clamps. Leave clamps loose. (Figure 13-4, Sheet 2, Detail F).

u. Slide replacement front bleed-air tube into position between mixing valve and rear bleed-air tube.

v. Position front and rear bleed-air tubes to line up ends where they connect.

w. On helicopters serial Nos 83-23838 and subsequent, do this:

  (1) Lubricate packing, MS9068-013, with petrolatum, Item 259, Appendix D. Install jamnut and packing on tee (Figure 13-4, Sheet 1, Detail B).

  (2) Coat threads of tee with antiseize compound, Item 78, Appendix D, and install in front bleed-air tube.

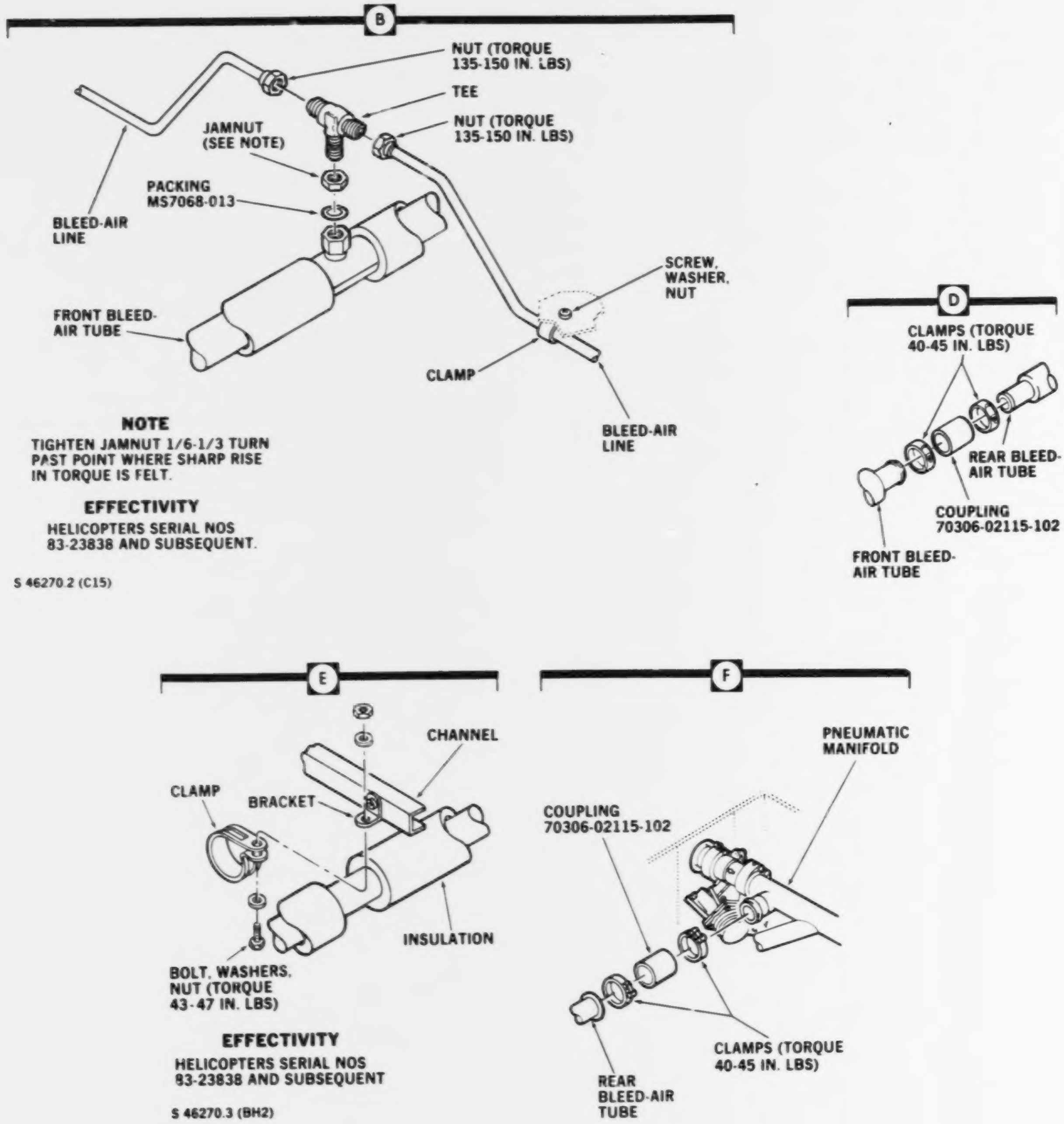
  (3) Coat threads of tee with antiseize compound, Item 78, Appendix D, and install in front bleed-air tube.

  (4) Connect bleed-air lines to tee in bleed-air tube. Do not torque nuts now.

  (5) **TIGHTEN JAMNUT ON TEE 1/6 TO 1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.**

  (6) Clamp tube to bracket on channel at WL283 with bolt, washer, and nut. **TORQUE NUT TO 43 - 47 INCH-POUNDS** (Figure 13-4, Sheet 2, Detail E).

13-1.4 REPLACE BLEED-AIR TUBE 13-1.4


B
NUT (TORQUE 135-150 IN. LBS)
TEE
NUT (TORQUE 135-150 IN. LBS)
JAMNUT (SEE NOTE)
PACKING MS7068-013
BLEED-AIR LINE
SCREW, WASHER, NUT
FRONT BLEED-AIR TUBE
CLAMP
BLEED-AIR LINE
D
CLAMPS (TORQUE 40-45 IN. LBS)
REAR BLEED-AIR TUBE
COUPLING 70306-02115-102
FRONT BLEED-AIR TUBE
E
CHANNEL
CLAMP
BRACKET
INSULATION
BOLT, WASHERS, NUT (TORQUE 43-47 IN. LBS)
F
PNEUMATIC MANIFOLD
COUPLING 70306-02115-102
CLAMPS (TORQUE 40-45 IN. LBS)
REAR BLEED-AIR TUBE

NOTE

TIGHTEN JAMNUT 1/6-1/3 TURN PAST POINT WHERE SHARP RISE IN TORQUE IS FELT.

EFFECTIVITY

HELICOPTERS SERIAL NOS 83-23838 AND SUBSEQUENT.

S 46270.2 (C15)

EFFECTIVITY

HELICOPTERS SERIAL NOS 83-23838 AND SUBSEQUENT

S 46270.3 (BH2)

Figure 13-4 (Sheet 2 of 2)

(7) **TORQUE NUTS ON LINE TO 135 - 150 INCH-POUNDS** (Figure 13-4, Sheet 1, Detail B).

x. Install clamp supporting tube at station 314 with bolts, washers, and nuts. **TORQUE NUTS TO 43 - 47 INCH-POUNDS.**

y. Connect front and rear tubes together with replacement tube coupling, 70306-02115-102, and clamps (Figure 13-4, Sheet 2, Detail D). **TORQUE CLAMPS TO 40 - 45 INCH-POUNDS.**

z. At pneumatic manifold. **TORQUE COUPLING CLAMPS TO 40 - 45 INCH-POUNDS.**

aa. On helicopters serial Nos 77-22714 through 77-22716 and serial Nos 77-22719 through 77-22726, connect front tube to mixing valve. Tighten tube nut.

ab. On helicopters serial Nos 77-22717 and 77-22718 and serial Nos 77-22727 and subsequent, connect front bleed-air tube to mixing valve with replacement tube coupling, 70306-02115-102, and clamps. **TORQUE CLAMPS TO 40 - 45 INCH-POUNDS.**

ac. Check operation of heating/ventilating system (TM 55-1520-237-T). Check tube connections for leaks.

ad. Make sure area is free of foreign objects before closing up.

ae. Close and latch main rotor pylon sliding fairing and oil cooler compartment access doors.

13-1.5 REPLACE MIXTURE TEMPERATURE SENSOR 13-1.5

REMOVE

a. Turn off all electrical power.

b. Unlatch and open main rotor pylon sliding fairing.

c. Remove soundproofing from cabin overhead from station 247 to station 265 (PARA 2-32).

CAUTION

Make sure rod length on adjustable control rods is not changed.

d. Disconnect and remove both cyclic control rods, and yaw control rod, to get to mixture temperature sensor (PARA 11-27).

e. Remove muffler from helicopter (PARA 13-1.9).

f. From inside cabin about station 254, disconnect heater control shaft from temperature sensor.

g. Disconnect lower temperature tube from temperature sensor.

h. From outside helicopter, have assistant reach down inside of interior cabin duct to hold screws. Remove nuts and washers attaching temperature sensor to duct. Remove sensor.

INSTALL

i. Turn off all electrical power.

j. From inside cabin, position replacement temperature sensor in interior duct.

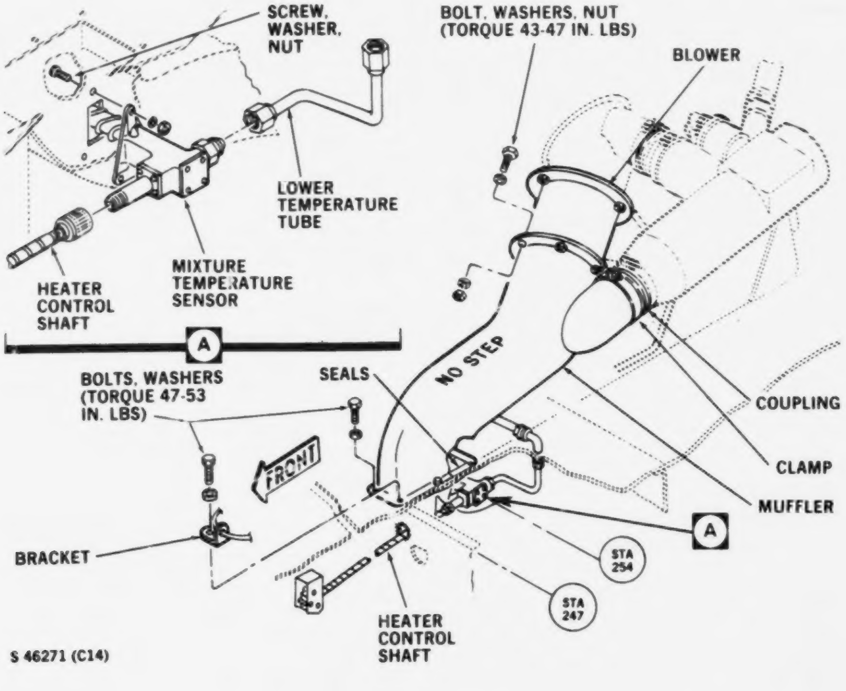

SCREW, WASHER, NUT
LOWER TEMPERATURE TUBE
MIXTURE TEMPERATURE SENSOR
HEATER CONTROL SHAFT
A
BOLT, WASHERS, NUT (TORQUE 43-47 IN. LBS)
BLOWER
NO STEP
SEALS
BOLTS, WASHERS (TORQUE 47-53 IN. LBS)
FRONT
COUPLING
CLAMP
MUFFLER
A
BRACKET
STA 254
STA 247
HEATER CONTROL SHAFT
S 46271 (C14)

FIGURE 13-5

13-1.5 REPLACE MIXTURE TEMPERATURE SENSOR 13-1.5

k. From outside helicopter, have assistant insert screws through interior duct and temperature sensor.

l. Install washers and nuts on screw. Tighten nuts.

m. Connect lower temperature tube to temperature sensor.

n. Connect heater control shaft to mixture temperature sensor and adjust control knob as follows:

  (1) Install slot, in end of heater control shaft on key in mixture temperature sensor. Install serrated nut and tighten.

  (2) On overhead control panel in cockpit, turn heater control knob counterclockwise until it stops. Do not force knob.

  (3) Loosen setscrews of heater control knob and line up mark on knob with OFF position on panel.

  (4) Tighten setscrews.

o. Reinstall two cyclic control rods, and yaw control rod (PARA 11-27).

p. Check inside of interior duct for foreign material.

q. Check condition of rubber seals before reinstalling muffler. If damaged, replace seals.

r. Install muffler on helicopter (PARA 13-1.9).

s. Check heating and ventilating system operation (TM 55-1520-237-T). Check tube connection for leaks.

t. Make sure area is free of foreign objects before closing up.

u. Reinstall soundproofing (PARA 2-32).

v. Make sure area is free of foreign objects before closing up.

w. Close and latch main rotor pylon sliding fairing.

13-1.6 REPLACE AIR OUTLETS

NOTE

Heating and ventilating system has eight air outlets, in different locations. Removal and installation is the same at each location except some are secured with rivets, some with screws.

REMOVE

a. Turn off all electrical power.

b. Remove screws or rivets fastening air outlets to heating/ventilating duct in cabin front section ceiling (Figure 13-6, Detail A or Detail B).

INSTALL

c. Turn off all electrical power.

d. Install air outlet on heating/ventilating duct with screws or rivets, NAS1739B6-5.

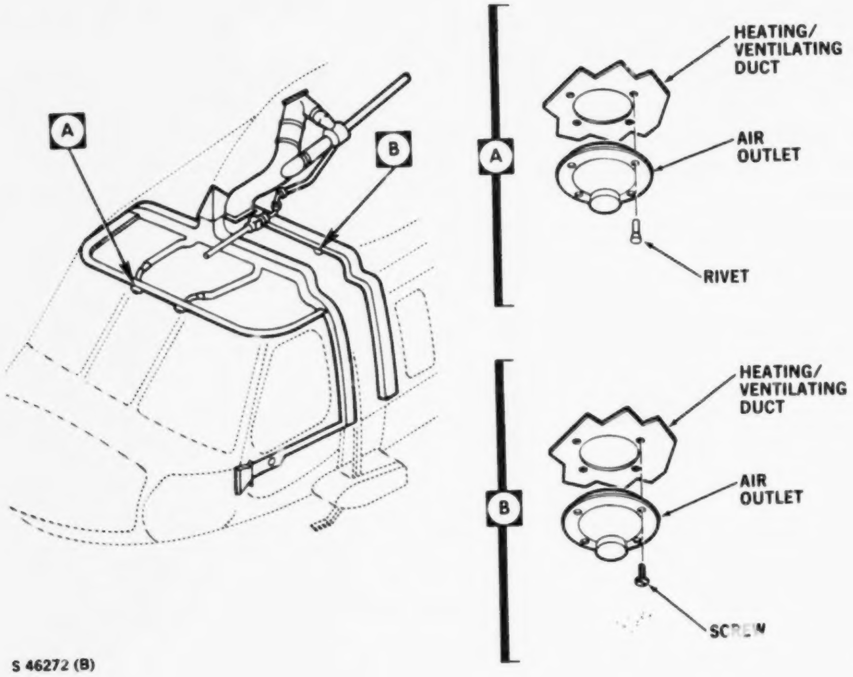

A
B
HEATING/ VENTILATING DUCT
AIR OUTLET
RIVET
HEATING/ VENTILATING DUCT
AIR OUTLET
SCREW
S 46272 (B)

FIGURE 13-6

13-1.7 REPLACE HEATER CONTROL SHAFT 13-1.7

REMOVE

a. Turn off all electrical power.

b. Remove soundproofing from cabin overhead from station 247 to station 265 (PARA 2-32).

CAUTION

Make sure rod length on adjustable control rods is not changed.

c. Disconnect and remove both cyclic control rods, and yaw control rod, to get to mixture temperature sensor (PARA 11-27).

d. In cockpit, unfasten fasteners holding upper console to cockpit overhead. Hinge down upper console.

e. Disconnect control shaft from adapter.

f. In cabin, disconnect control shaft from mixture temperature sensor.

g. Slide control shaft out of grommet in station 247 frame. Remove shaft from helicopter.

INSTALL

h. Turn off all electrical power.

i. Check condition of grommet in frame at station 247. If damaged or deteriorated, replace.

j. Insert replacement control shaft through grommet in frame. Connect shaft to mixture temperature sensor in cabin.

k. Connect opposite end of shaft to adapter.

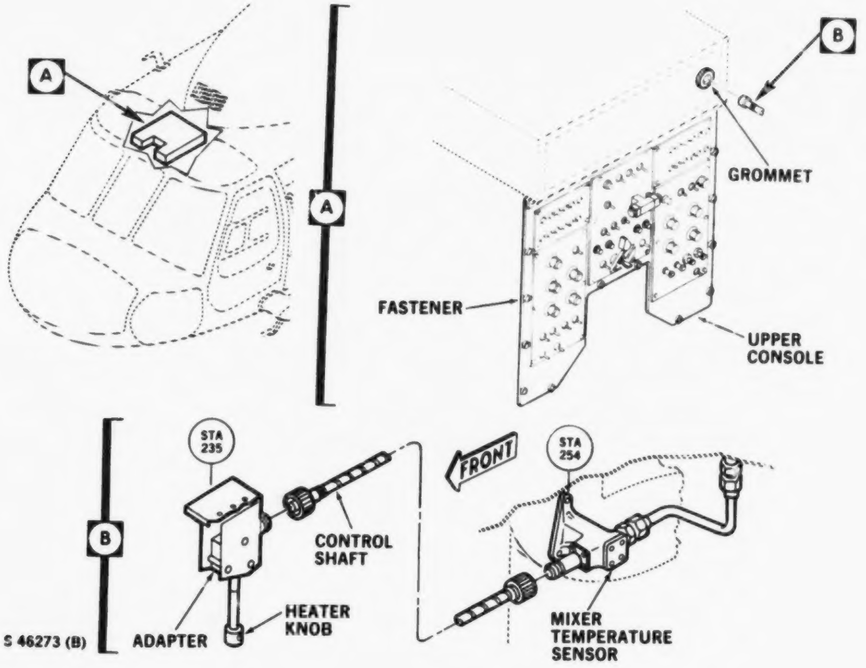

A
A
B
GROMMET
FASTENER
UPPER CONSOLE
B
STA 235
CONTROL SHAFT
FRONT
STA 254
HEATER KNOB
ADAPTER
MIXER TEMPERATURE SENSOR
S 46273 (B)

FIGURE 13-7

13-1.7 REPLACE HEATER CONTROL SHAFT 13-1.7

l. Check inside of upper console for foreign material. Close and fasten upper console to cockpit overhead.

m. Line up control with mixture temperature sensor as follows:

   (1) Turn adapter shaft (control knob attached) counterclockwise until it stops.

   (2) Loosen setscrews of attaching control knob to shaft and line up mark on knob with OFF position on panel.

   (3) Tighten setscrews.

n. Reinstall two cyclic control rods, and yaw control rod (PARA 11-27).

o. Check heating and ventilating system operation (TM 55-1520-237-T).

p. Make sure area is free of foreign objects before closing up.

q. Reinstall soundproofing (PARA 2-32).

13-1.8 REPLACE HEATER CONTROL ADAPTER 13-1.8

REMOVE

a. Turn off all electrical power.

b. Unfasten fasteners holding upper console to cockpit overhead. Hinge down upper console.

c. Unscrew knurled nut on control shaft until free of adapter.

d. Loosen setscrews and remove heater control knob and shaft from adapter.

e. Remove front screw, washers, nut, and spacer from attachment bracket.

f. Loosen remaining two screws.

g. Slide adapter forward from between remaining spacers in attachment bracket and remove adapter from bracket.

INSTALL

h. Turn off all electrical power.

i. Slide adapter aft between spacers in attachment bracket and into control shaft. Insert and fasten front spacer between bracket ears with screw, washers, and nut.

j. Tighten remaining two screws.

k. Install heater control knob and shaft into adapter and tighten setscrews.

l. Screw knurled nut of control shaft onto adapter.

m. Carefully hinge up upper console to make sure heater control knob and shaft line up with hole in upper console.

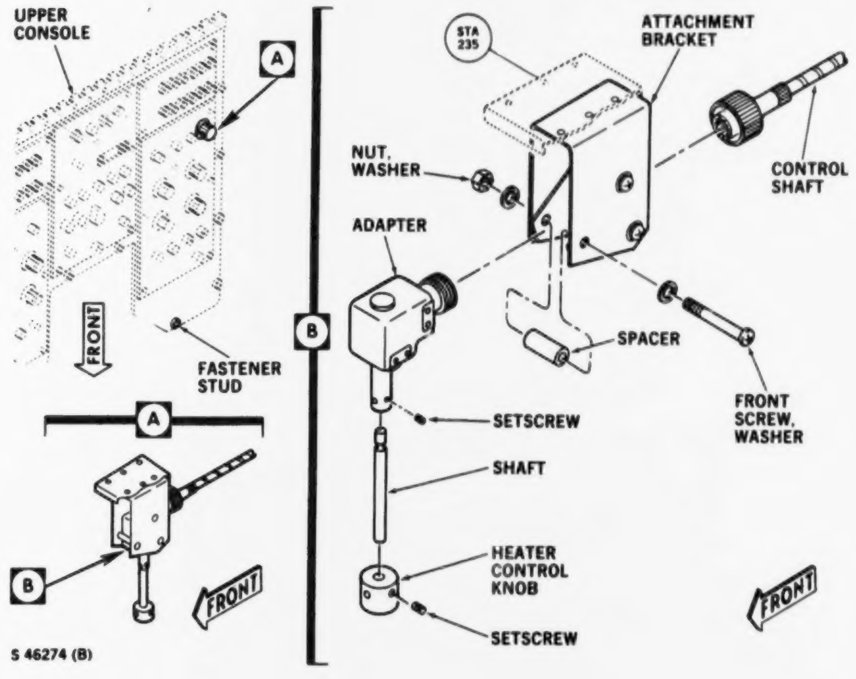

UPPER CONSOLE
A
FRONT
FASTENER STUD
A
B
S 46274 (B)
FRONT
B
STA 235
ATTACHMENT BRACKET
NUT, WASHER
CONTROL SHAFT
ADAPTER
SPACER
FRONT SCREW, WASHER
SETSCREW
SHAFT
HEATER CONTROL KNOB
SETSCREW
FRONT

FIGURE 13-8

13-1.8 REPLACE HEATER CONTROL ADAPTER 13-1.8

n. If heater control knob and shaft does not line up with hole in upper console, loosen front screw in attachment bracket and reposition adapter in bracket until they line up.

o. Make sure area is free of foreign objects before closing up.

p. Fasten upper console to cockpit overhead.

q. Turn HEATER knob on upper console counterclockwise until stopped. If required, loosen setscrews in knob, line up marker on knob with OFF position, and tighten setscrews.

r. Check heating and ventilating system operation (TM 55-1520-237-T).

13-1.9 REPLACE MUFFLER ASSEMBLY 13-1.9

REMOVE

a. Turn off all electrical power.

b. Unlatch and open main rotor pylon sliding fairing.

c. Remove bolts and washers from muffler and move wire and bracket to one side.

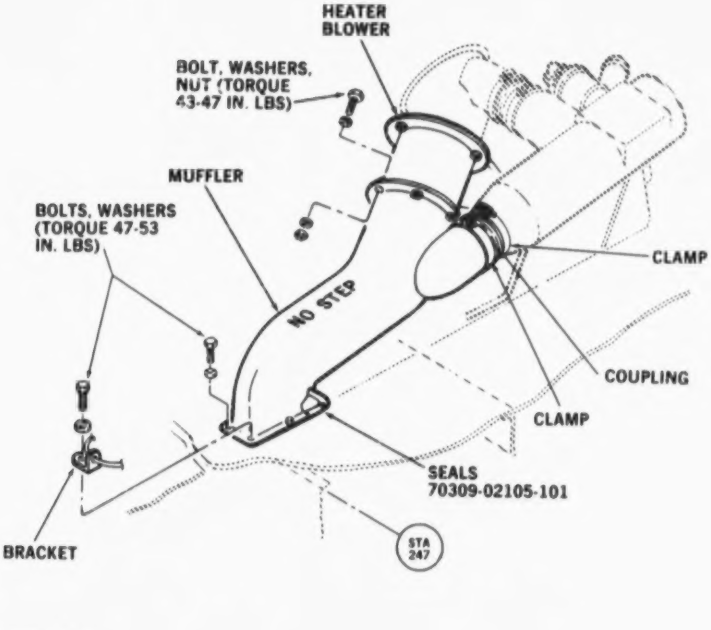
d. Loosen clamp attaching front mixing valve coupling to heater muffler. Slip coupling off muffler.

e. Remove bolts, washers, and nuts attaching muffler to heater blower. Carefully remove muffler from helicopter.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

f. Use a clean cloth dampened in methyl ethyl ketone, Item 233, Appendix D, and a nonmetallic scraper to remove old adhesive from attaching hardware, muffler, and cabin skin.


HEATER BLOWER
BOLT, WASHERS, NUT (TORQUE 43-47 IN. LBS)
MUFFLER
BOLTS, WASHERS (TORQUE 47-53 IN. LBS)
NO STEP
CLAMP
COUPLING
CLAMP
SEALS 70309-02105-101
STA 247
BRACKET

S 46275 (C14)

FIGURE 13-9

13-1.9 REPLACE MUFFLER ASSEMBLY 13-1.9

INSPECT

g. Check condition of rubber seals on deck before installing muffler. Replace seals, 70309-02113-101, if damaged.

h. Check interior of duct for foreign material.

INSTALL

NOTE

To prevent gaps at heater duct flanged joints, existing seal may be built up with adhesive, Item 57, Appendix D, to a maximum thickness of 0.060 inch.

i. Apply a light bead of sealing compound, Item 312, Appendix D, around boltholes in muffler.

j. Place muffler into position and install bracket, bolts, and washers attaching muffler to cabin skin. **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.**

k. Apply a light bead of sealing compound, Item 312, Appendix D, around edge of muffler where it mates with cabin skin.

l. Attach muffler to heater blower with bolts, washers, and nuts. **TORQUE NUTS TO 43 - 47 INCH-POUNDS.**

m. Slide coupling over muffler and fasten with clamp.

n. Make sure area is free of foreign objects before closing up.

o. Close and latch main rotor pylon sliding fairing.

13-1.10 REPLACE COCKPIT DOOR DUCTS 13-1.10

a. Turn off all electrical power.

b. Remove rivets and washers fastening air outlet to heating/ventilating duct. (Figure 13-10, Detail A or Detail B).

c. Remove screws and washers and carefully separate heating and ventilating ducts. Remove duct (Figure 13-10, Detail A).

d. Remove chin window duct by drilling out rivets holding duct to door frame.

e. Remove heating/ventilating duct from door by removing screws, and washers, and bolt and washer. Push down on duct to disengage hidden retaining latch.

f. If necessary, remove ash receiver from duct by removing screws, washers, and nuts.

g. Install chin window duct on door frame with rivets.

h. If removed, install ash receiver on replacement heating/ventilating duct with screws, washers, and nuts (Figure 13-10, Detail B).

i. Install duct on door by sliding duct forward from rear to engage hidden retaining latch. Install screws and washers holding duct in place.

j. Trim upper edge of flange as necessary to stop interference between edge of flange and door jettison handle. Trim edge using procedures in PARA 2-10.

k. Carefully place heating/ventilating duct in position and secure with screws and washers (Figure 13-10, Detail A).

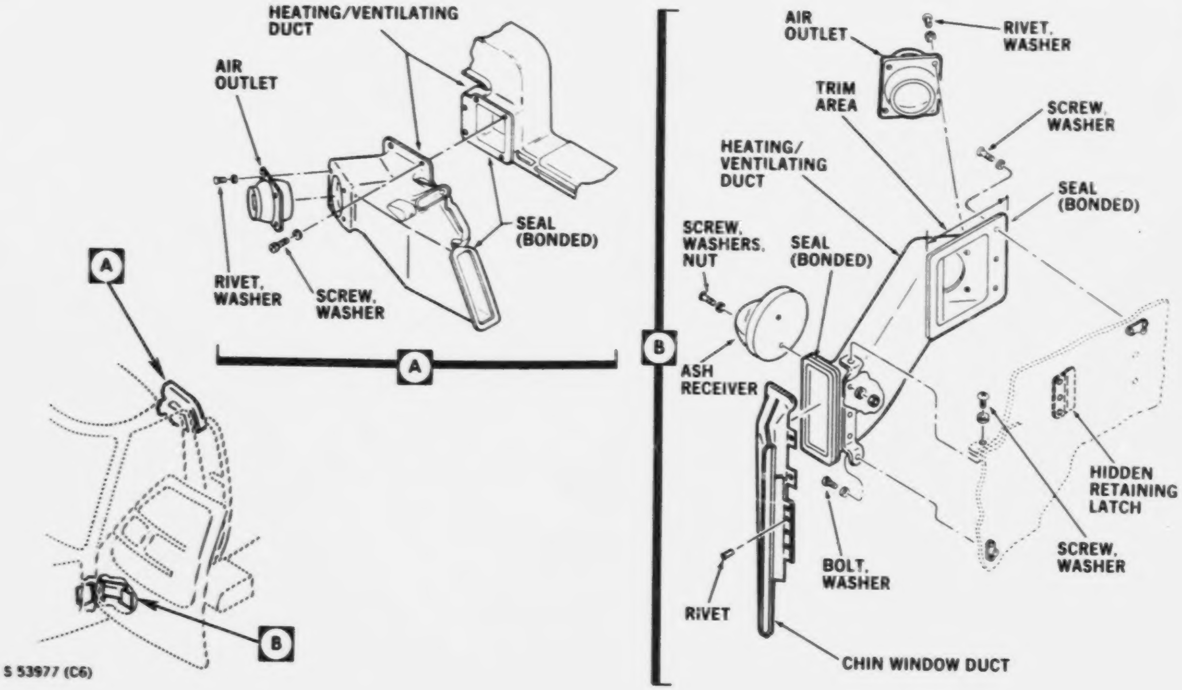

HEATING/VENTILATING DUCT
AIR OUTLET
SEAL (BONDED)
RIVET, WASHER
SCREW, WASHER
A
A
B
S 53977 (C6)
AIR OUTLET
RIVET, WASHER
TRIM AREA
SCREW, WASHER
HEATING/ VENTILATING DUCT
SEAL (BONDED)
SCREW, WASHERS, NUT
SEAL (BONDED)
B
ASH RECEIVER
HIDDEN RETAINING LATCH
SCREW, WASHER
BOLT, WASHER
RIVET
CHIN WINDOW DUCT

FIGURE 13-10

13-1.10 REPLACE COCKPIT DOOR DUCTS 13-1.10

l. Place air outlet in heating/ventilating duct and secure with rivets and washers.

m. If installing new duct, do this:

(1) Trial-fit duct.

(2) Mark holes that do not line up with nutplates.

(3) Fill marked holes using procedures in PARA 2-3.

(4) Mark and drill new holes using mounting duct as template.

13-2 REPAIR HEAT AND VENTILATION SYSTEM 13-2

PARAGRAPH BREAKDOWN

13-2.1	REPAIR HEAT AND VENT SYSTEM
13-2.2	REPLACE SEALS AND GASKETS
13-2.3	REPAIR ENVIRONMENTAL CONTROL SYSTEM DUCTING

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68G - Aircraft Structural Repairer

MATERIALS/PARTS

- Abrasive Cloth, Item 1, Appendix D
- Adhesive, Item 35, Appendix D
- Adhesive, Item 31, Appendix D
- Adhesive Primer, Item 30, Appendix D
- Epoxy Primer, Item 150, Appendix D
- Fiberglass Repair Kit, Item 151, Appendix D
- Methyl Ethyl Ketone, Item 233, Appendix D
- Paint Item 248, Appendix D

TOOLS

- Airframe Repairer's Toolkit, SC 5180-99-CL-A02

REFERENCES

- PARA 2-1
- PARA 2-2
- PARA 2-3
- PARA 2-5
- TM 55-1500-204-25/1
- TM 55-1500-345-23

13-2.1 REPAIR HEAT AND VENT SYSTEM (CONT) 13-2.1

REPAIR

a. Heat and vent ducts are made from Kevlar/epoxy (reinforced plastic). Dampers, slide assemblies, brackets, and angles are aluminum alloy. Shafts for dampers are made from 4130 steel rod.

b. Evaluate and repair damage to Kevlar ducts (PARA 2-3).

c. Evaluate damage to aluminum parts (PARA 2-1).

d. Use PARA 2-2 for typical repairs to aluminum parts. Refer to TM 55-1500-204-25/1 for repair materials and fastener information.

e. Rebond seals using adhesive, Item 35, Appendix D. Rebond ducts using adhesive primer, Item 30, Appendix D, and adhesive, Item 31, Appendix D. Apply adhesives per manufacturer's instructions.

f. Touch up paint as required (PARA 2-5 and TM 55-1500-345-23).

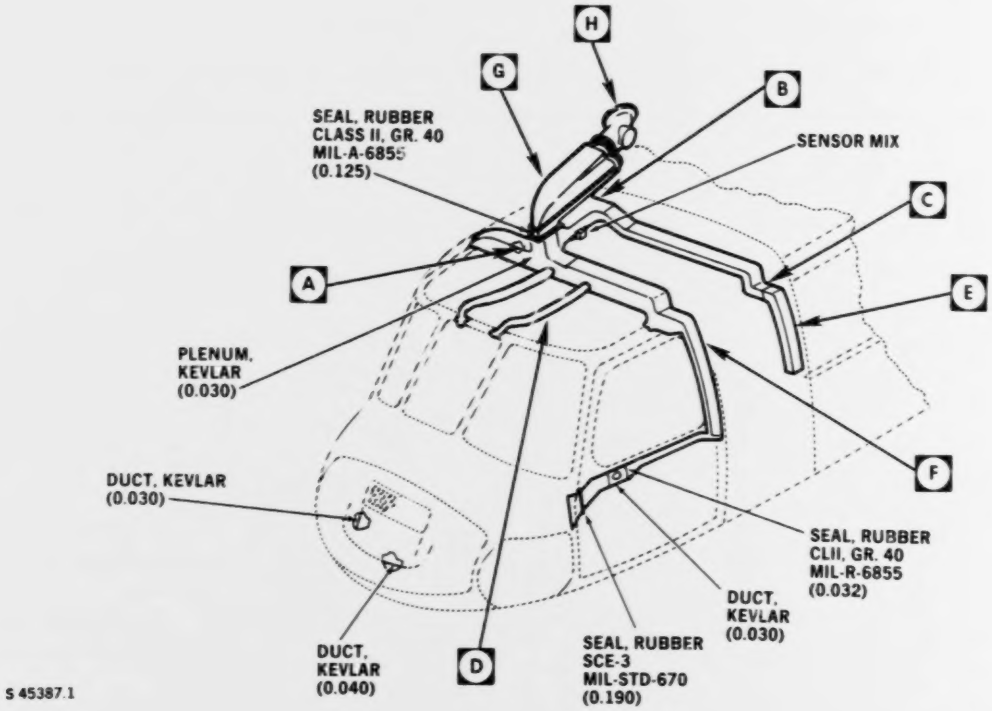
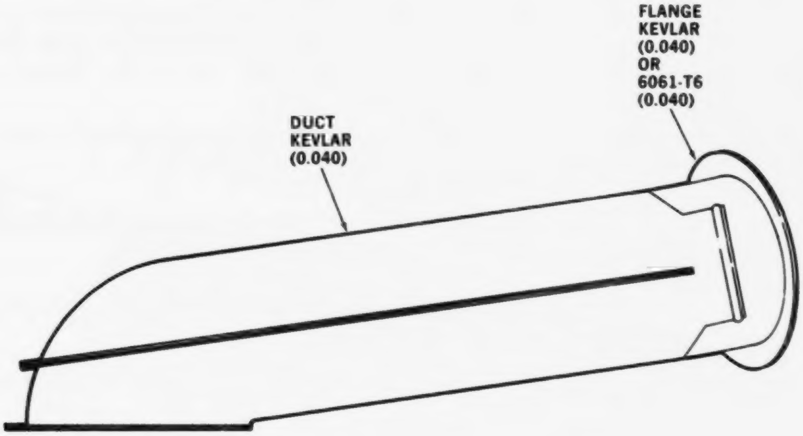
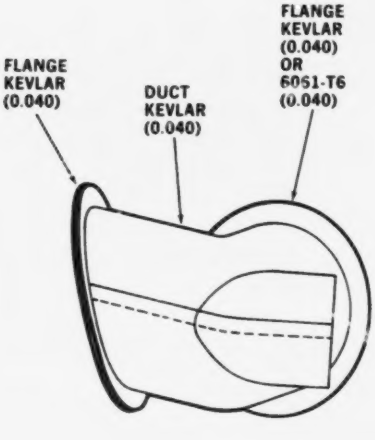

H
G
B
SEAL, RUBBER
CLASS II, GR. 40
MIL-A-6855
(0.125)
SENSOR MIX
C
A
E
PLENUM,
KEVLAR
(0.030)
F
DUCT, KEVLAR
(0.030)
SEAL, RUBBER
CLII, GR. 40
MIL-R-6855
(0.032)
DUCT,
KEVLAR
(0.030)
SEAL, RUBBER
SCE-3
MIL-STD-670
(0.190)
D
DUCT,
KEVLAR
(0.040)
S 45387.1

FIGURE 13-11 (SHEET 1 OF 3)


FLANGE
KEVLAR
(0.040)
OR
6061-T6
(0.040)
DUCT
KEVLAR
(0.040)

LOOKING OUTBOARD B L 10

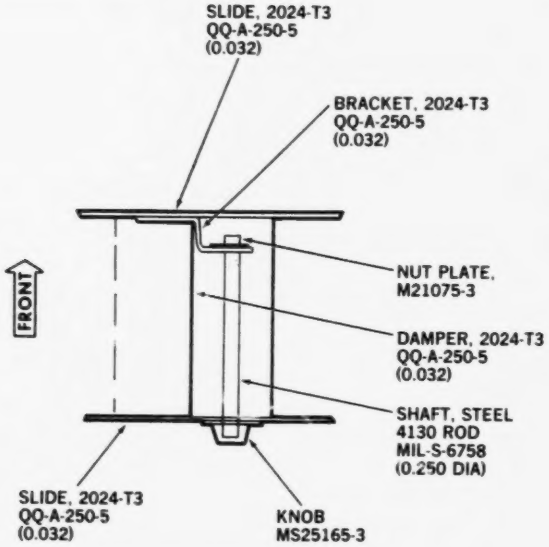
G


FLANGE
KEVLAR
(0.040)
DUCT
KEVLAR
(0.040)
FLANGE
KEVLAR
(0.040)
OR
6061-T6
(0.040)

LOOKING OUTBOARD B L 18

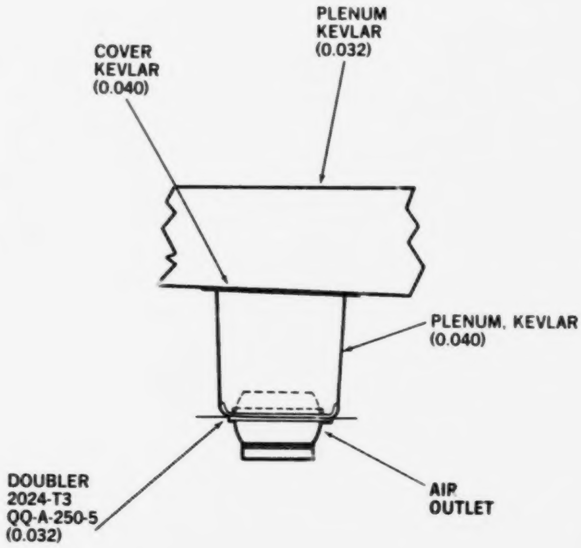
H

S 45387.1.1 (C18)


SLIDE, 2024-T3
QQ-A-250-5
(0.032)
BRACKET, 2024-T3
QQ-A-250-5
(0.032)
FRONT
NUT PLATE,
M21075-3
DAMPER, 2024-T3
QQ-A-250-5
(0.032)
SHAFT, STEEL
4130 ROD
MIL-S-6758
(0.250 DIA)
SLIDE, 2024-T3
QQ-A-250-5
(0.032)
KNOB
MS25165-3

LOOKING DOWN - BL 19.48

A


PLENUM
KEVLAR
(0.032)
COVER
KEVLAR
(0.040)
PLENUM, KEVLAR
(0.040)
DOUBLER
2024-T3
QQ-A-250-5
(0.032)
AIR
OUTLET

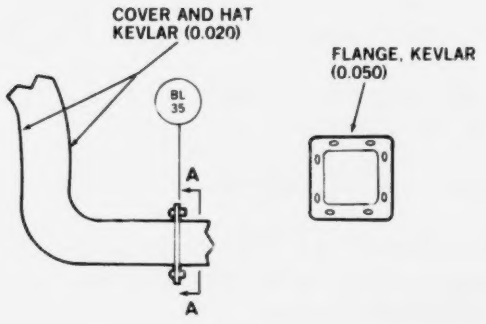
LOOKING FRONT - STA 265 RH

B

S 45387.2

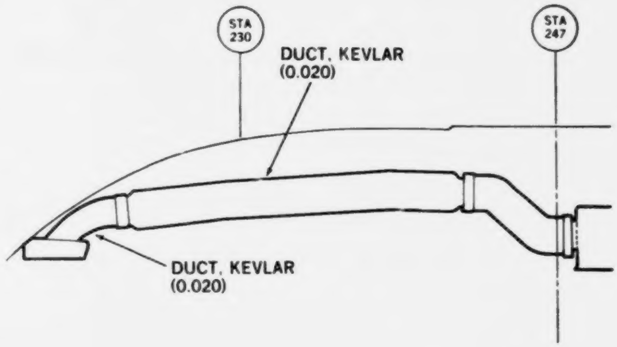
FIGURE 13-11 (SHEET 2 OF 3)

13-2.1 REPAIR HEAT AND VENT SYSTEM (CONT) 13-2.1


COVER AND HAT
KEVLAR (0.020)
BL
35
A
A
FLANGE, KEVLAR
(0.050)

LOOKING FRONT - STA 265 RH

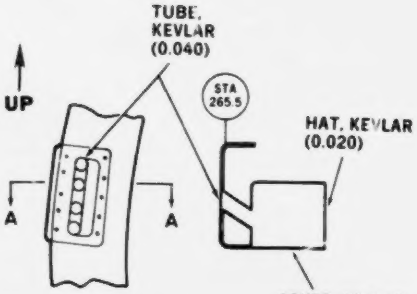
C


STA
230
STA
247
DUCT, KEVLAR
(0.020)
DUCT, KEVLAR
(0.020)

LOOKING INBOARD - BL10 LH

D

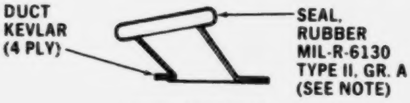
S 45387.3


TUBE,
KEVLAR
(0.040)
UP
STA
265.5
HAT, KEVLAR
(0.020)
A
A
COVER, KEVLAR
(0.020)

LH - LOOKING FRONT

SECTION A-A

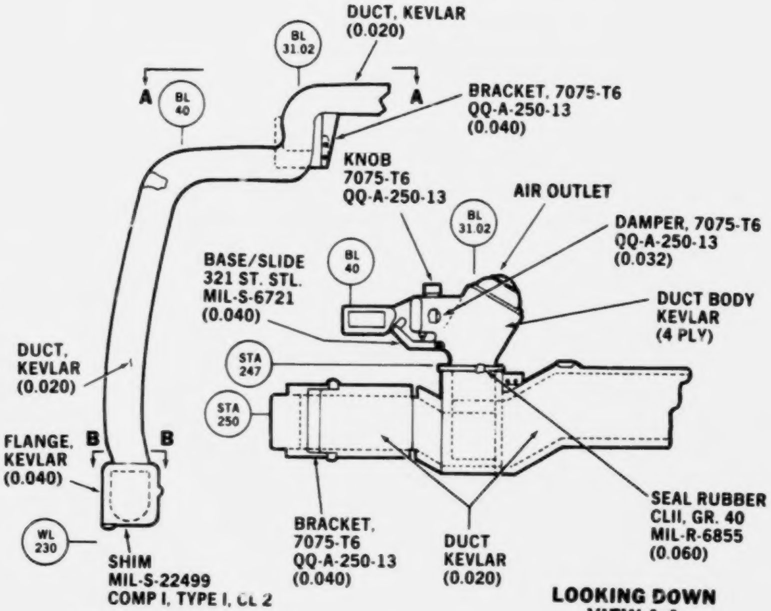
E


DUCT
KEVLAR
(4 PLY)
SEAL,
RUBBER
MIL-R-6130
TYPE II, GR. A
(SEE NOTE)

SECTION B-B

NOTE
POSITION SEAL JOINT ON CENTER OF FLANGE ON INBOARD SIDE

S 45387.4


DUCT, KEVLAR
(0.020)
BL
31.02
A
A
BL
40
BRACKET, 7075-T6
QQ-A-250-13
(0.040)
KNOB
7075-T6
QQ-A-250-13
AIR OUTLET
BL
31.02
DAMPER, 7075-T6
QQ-A-250-13
(0.032)
BASE/SLIDE
321 ST. STL.
MIL-S-6721
(0.040)
BL
40
DUCT BODY
KEVLAR
(4 PLY)
DUCT,
KEVLAR
(0.020)
STA
247
STA
250
FLANGE,
KEVLAR
(0.040)
B
B
WL
230
SHIM
MIL-S-22499
COMP I, TYPE I, CL 2
BRACKET,
7075-T6
QQ-A-250-13
(0.040)
DUCT
KEVLAR
(0.020)
SEAL RUBBER
CLII, GR. 40
MIL-R-6855
(0.060)

LH - LOOKING FRONT

LOOKING DOWN VIEW A-A

F

FIGURE 13-11 (SHEET 3 OF 3)

13-2.2 REPLACE SEALS AND GASKETS 13-2.2

REMOVE COCKPIT DUCT DOOR SEAL

a. Remove screws attaching duct to cockpit door (Figure 13-12, Sheet 1, Detail A).

b. Peel old seal from duct.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

c. Clean bond area of old adhesive with clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

INSTALL COCKPIT DUCT DOOR SEAL

d. Roughen bonding surface of replacement seal with medium-grit abrasive cloth, Item 1, Appendix D.

e. Apply a smooth even coat of adhesive, Item 35, Appendix D, to mating surfaces of seal and duct. Allow adhesive to air-dry for about 10 minutes or until it becomes tacky.

f. Press seal firmly in place. Make sure all surfaces are in good contact. Allow seal to cure for 24 hours at 68°F (20°C).

g. Install screw, washer duct to top clip with screws and washers.

REMOVE UPPER CABIN DUCT SEALS

h. Remove screws attaching duct (Figure 13-12, Sheet 1, Detail B).

i. Peel old seals from duct.

j. Clean bond area of old adhesive with clean cloth moistened with methyl ethyl ketone, Item 233, Appendix D.

INSTALL UPPER CABIN DUCT SEALS

k. Roughen bonding surface of replacement seal with medium-grit abrasive cloth, Item 1, Appendix D.

l. Apply a smooth even coat of adhesive, Item 35, Appendix D, to mating surfaces seal and duct. Allow adhesive to air-dry for about 10 minutes or until it becomes tacky.

m. Press seal firmly in place. Make sure all surfaces are in good contact. Allow seal to cure for 24 hours at 68°F (20°C).

n. Install screws, MS27039-1-08, and washers, AN960KD10L.

REMOVE LOWER CABIN DUCT SEAL

o. Peel old seal from duct (Figure 13-12, Sheet 2, Detail C).

p. Clean bond area of old adhesive with clean cloth moistened with methyl ethyl ketone, Item 233, Appendix D.

13-2.2 REPLACE SEALS AND GASKETS 13-2.2

INSTALL LOWER CABIN DUCT SEAL

q. Roughen bonding surface of replacement seal with abrasive cloth, Item 1, Appendix D.

r. Apply a smooth even coat of adhesive, Item 35, Appendix D, to mating surfaces of seal and duct. Allow adhesive to air-dry for about 10 minutes or until it becomes tacky.

NOTE

When bonding seal to duct locate split of seal at about midpoint of duct on inboard side.

s. Press seal firmly in place. Make sure all surfaces are in good contact. Allow seal to cure for 24 hours at 68°F (20°C).

REMOVE PLENUM MUFFLER SEAL AND GASKETS

t. Remove attaching muffler from plenum. (PARA 13-1).

u. Remove screws from clamp assembly (Figure 13-12, Detail D).

v. Peel seal from duct, and gaskets from clamp assembly.

WARNING

- Volatile and toxic fumes occur when using solvents, causing both a fire and a health hazard.
- Provide proper ventilation and protective clothing, including eye shield, when using solvents. Avoid breathing vapors and skin contact as much as possible. Wash contacted skin with soap and water. If solvent contacts eyes, flush them with clean water and get immediate medical help.

w. Clean bond area of old adhesive with clean cloth dampened with methyl ethyl ketone, Item 233, Appendix D.

INSTALL PLENUM MUFFLER SEALS AND GASKETS

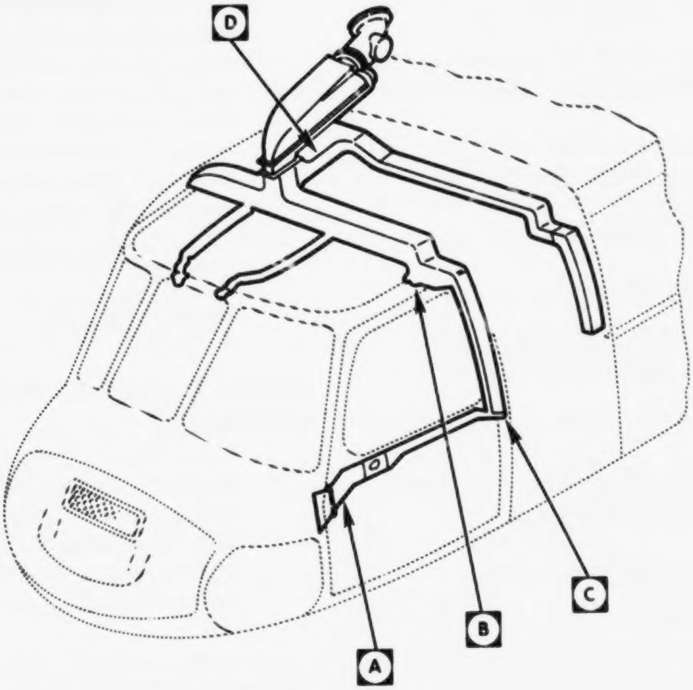
x. Roughen bonding surface of replacement seal and gaskets with medium-grit abrasive cloth, Item 1, Appendix D. Wipe clean with cloth moistened with methyl ethyl ketone, Item 233, Appendix D.

y. Apply a smooth even coat of adhesive, Item 35, Appendix D, to mating surfaces. Allow adhesive to air-dry for about 10 minutes or until it becomes tacky.

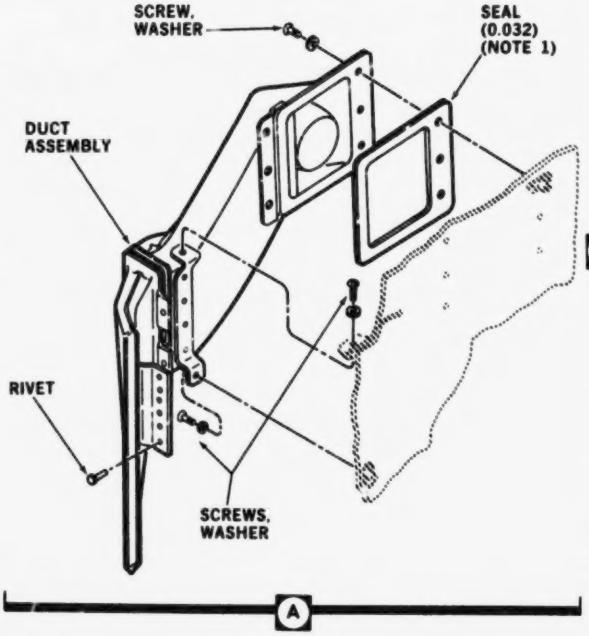
z. Press seal and gaskets firmly in place. Make sure that all surfaces are in good contact. Allow adhesive to cure for 24 hours at 68°F (20°C).

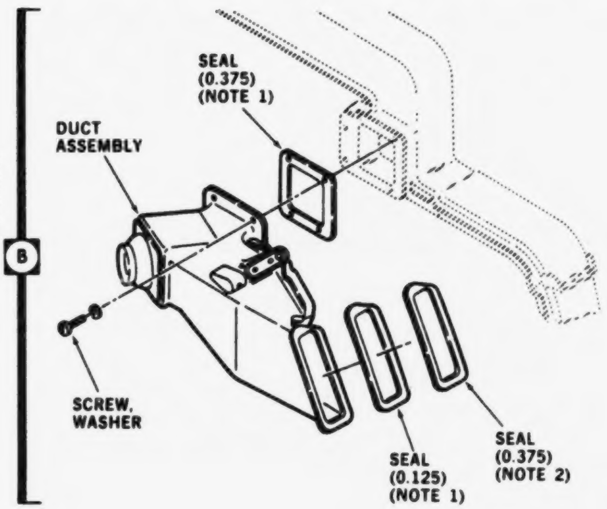
aa. Install muffler on plenum (PARA 13-1).

ab. Install clamp with screws and washers.



S 79854.1 (C15)


SCREW, WASHER
SEAL (0.032) (NOTE 1)
DUCT ASSEMBLY
RIVET
SCREWS, WASHER
A


SEAL (0.375) (NOTE 1)
DUCT ASSEMBLY
B
SCREW, WASHER
SEAL (0.125) (NOTE 1)
SEAL (0.375) (NOTE 2)

NOTES

1. MAKE FROM SYNTHETIC RUBBER, MIL-R-6855 CLASS 2 GRADE 40.
2. MAKE FROM CELLULAR RUBBER, MIL-R-6130 TYPE 2 GRADE A SOFT.
3. MAKE FROM MOLDED SYNTHETIC RUBBER, MIL-R-6130, TYPE 2, GRADE A, MEDIUM.

S 79854.2 (C15)

FIGURE 13-12 (SHEET 1 OF 2)

13-2.2 REPLACE SEALS AND GASKETS 13-2.2

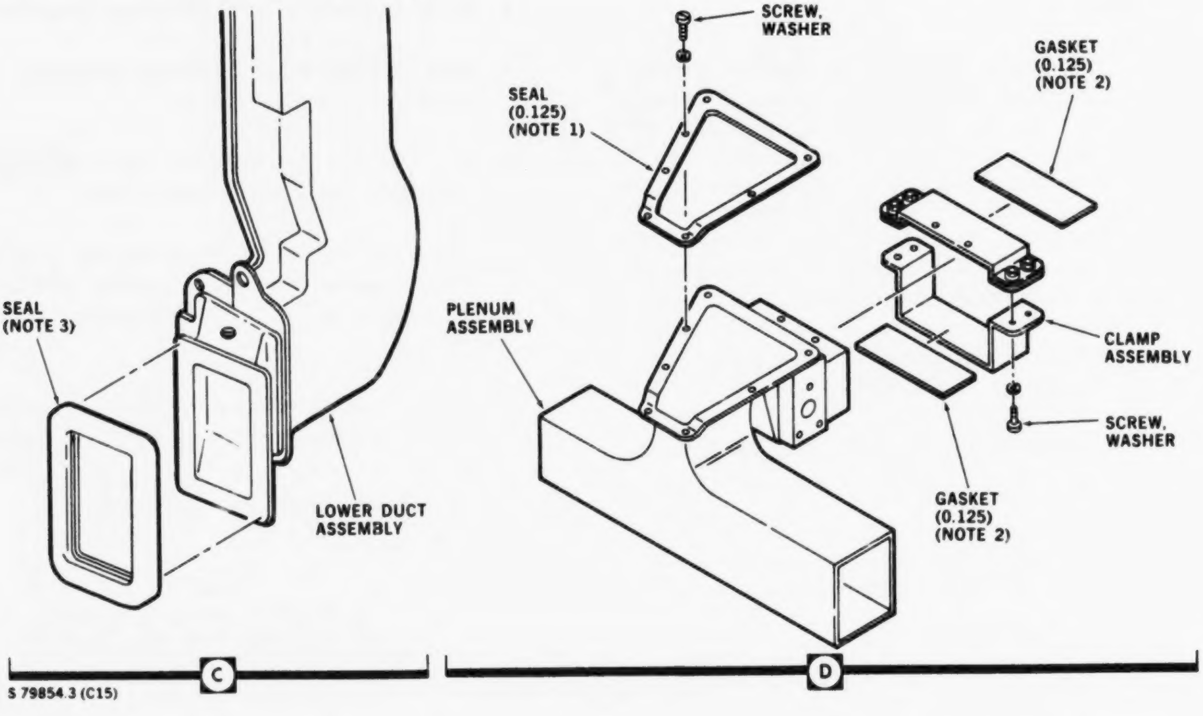

SEAL
(NOTE 3)
LOWER DUCT
ASSEMBLY
SCREW,
WASHER
SEAL
(0.125)
(NOTE 1)
GASKET
(0.125)
(NOTE 2)
PLENUM
ASSEMBLY
CLAMP
ASSEMBLY
SCREW,
WASHER
GASKET
(0.125)
(NOTE 2)
C
D
S 79854.3 (C15)

FIGURE 13-12 (SHEET 2 OF 2)

13-2.3 REPAIR ENVIRONMENTAL CONTROL SYSTEM DUCTING 13-2.3

REPAIR

a. The environmental control system ducting is composed of a diving cell foam and fiberglass duct section with 7075-T6 aluminum alloy cover which is welded and riveted together. Mounting provisions consist of bracket assemblies, made of 7075-T6 aluminum alloy, to which are fastened rubber isolators which suspend the ducting from the overhead cabin structure. The ducting mounted along the upper cabin between station 398 and station 449 is suspended on aluminum alloy hangers. All ducting is secondary structure.

b. Evaluate damage to the ducting per PARA 2-1.

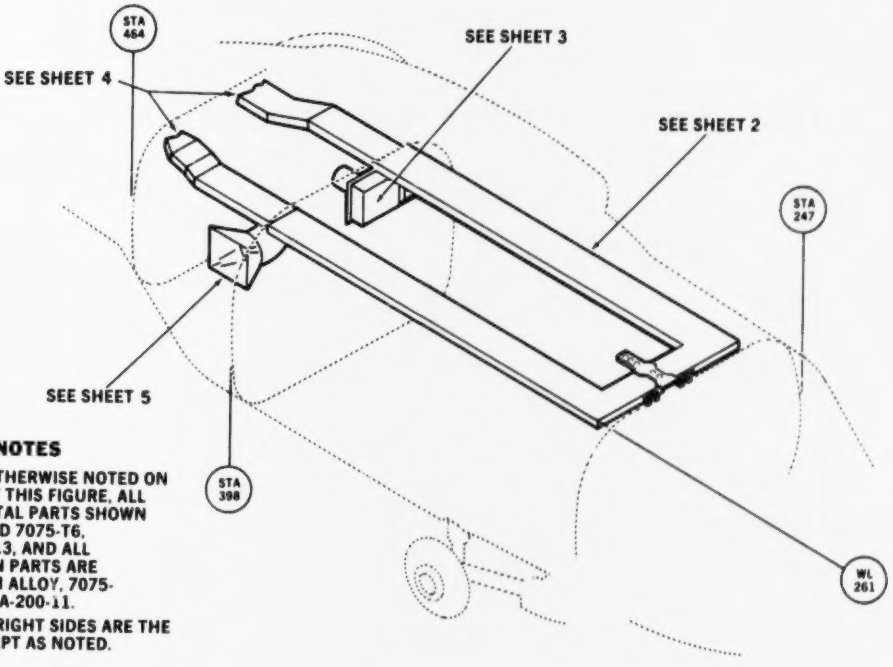
c. Refer to PARA 2-2 for aluminum repairs.

d. Refer to PARA 2-3, for damage evaluation and repair of fiberglass parts.

e. Refer to TM 55-1500-204-25/1 for repair materials and fastener information.

f. When making riveted patch repairs, seal for water integrity corrosion protection with sealing compound, Item 312, Appendix D, per PARA 2-1.

g. Touch up repair areas with epoxy primer, Item 150, Appendix D and paint Item 248, Appendix D.

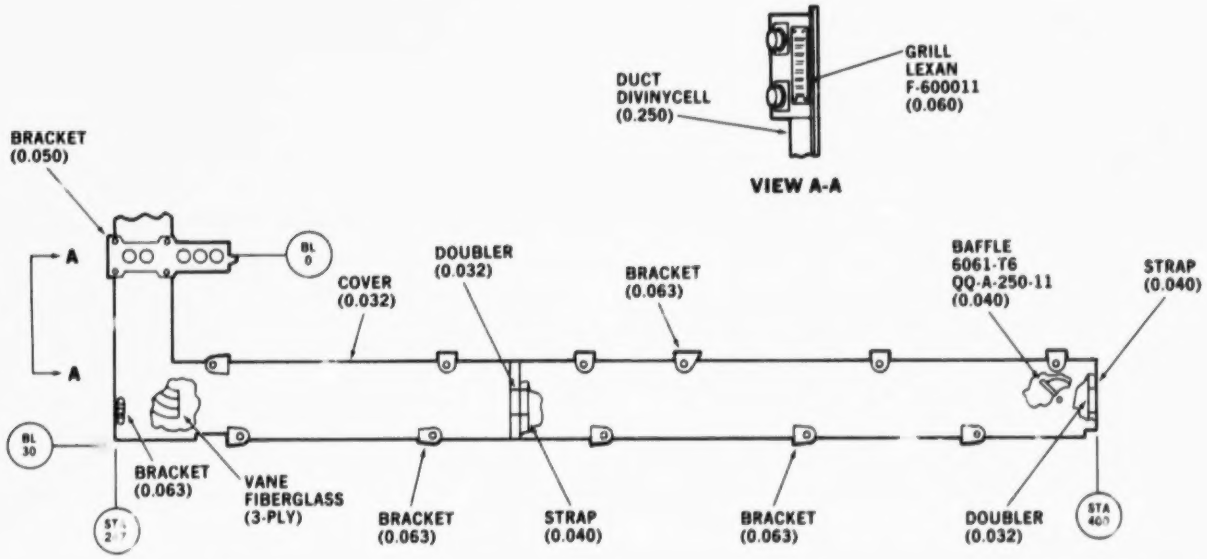


NOTES

1. UNLESS OTHERWISE NOTED ON SHEETS OF THIS FIGURE, ALL SHEET METAL PARTS SHOWN ARE ALCLAD 7075-T6, QQ-A-250-13, AND ALL EXTRUSION PARTS ARE ALUMINUM ALLOY, 7075-T6511, QQ-A-200-11.
2. LEFT AND RIGHT SIDES ARE THE SAME EXCEPT AS NOTED.

S 94366.1 (QF)

FIGURE 13-13 (SHEET 1 OF 3)

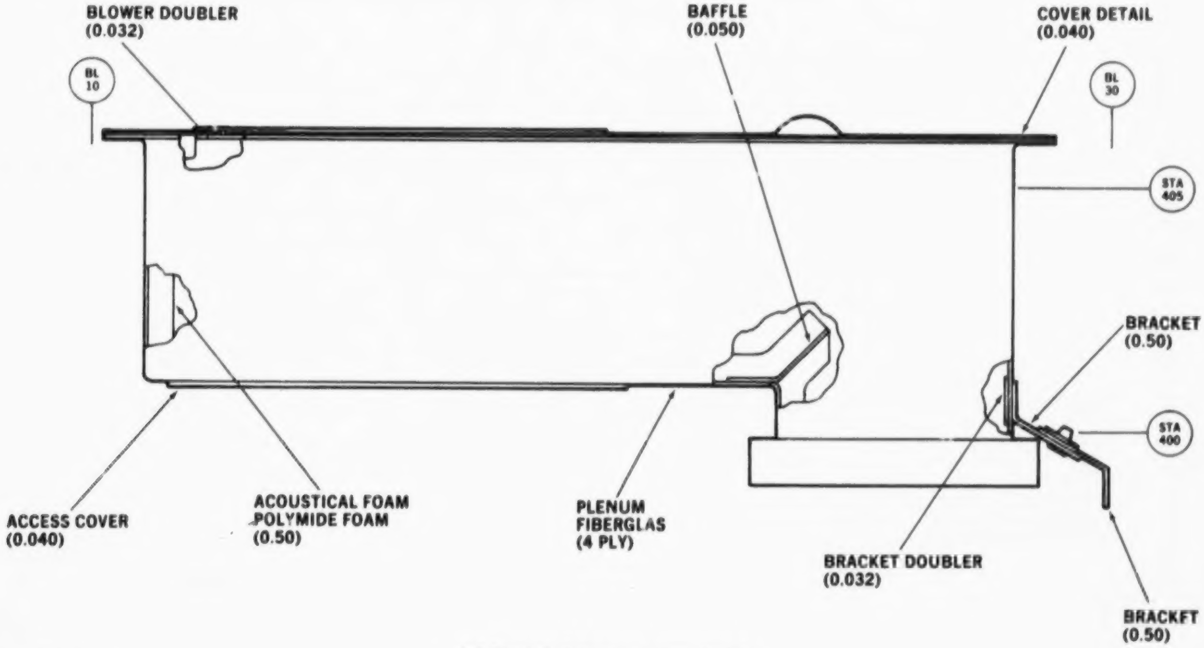

DUCT
DIVINYCELL
(0.250)
GRILL
LEXAN
F-600011
(0.060)
VIEW A-A
BRACKET
(0.050)
A
A
BL 0
COVER
(0.032)
DOUBLER
(0.032)
BRACKET
(0.063)
BAFFLE
6061-T6
QQ-A-250-11
(0.040)
STRAP
(0.040)
BL 30
BRACKET
(0.063)
VANE
FIBERGLASS
(3-PLY)
BRACKET
(0.063)
STRAP
(0.040)
BRACKET
(0.063)
DOUBLER
(0.032)
STA 247
STA 400

NOTE

1. ALL ECS METAL DUCTING PARTS, WALLS, BAFFLES, ANGLES, ETC. ARE MADE FROM 7075-T6 AL ALLOY, QQ-A-250-13 AND ARE 0.032 STOCK EXCEPT AS NOTED.

S 94366.2 (QF)

CABIN ECS DUCTING - LEFT SIDE LOOKING DOWN
RIGHT SIDE OPPOSITE

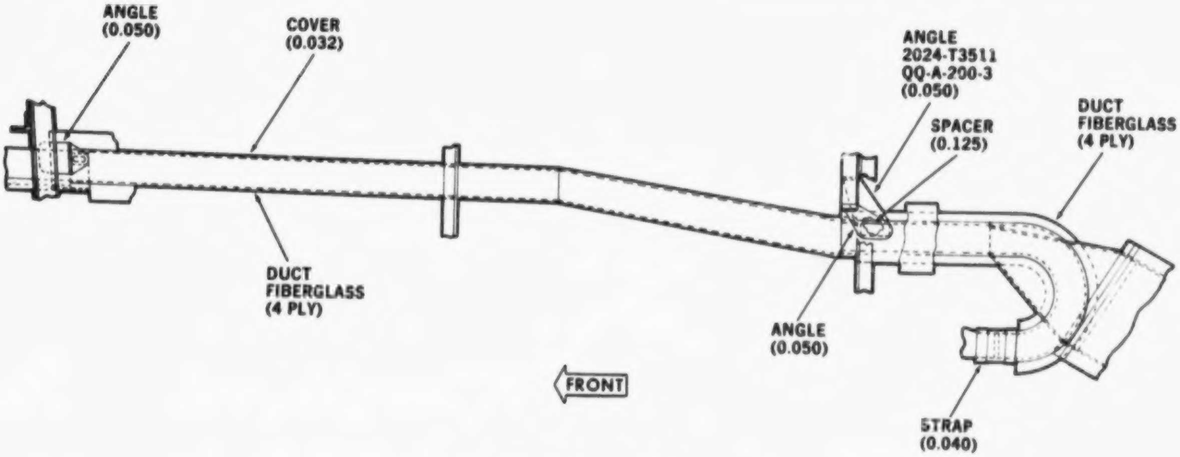

BLOWER DOUBLER
(0.032)
BAFFLE
(0.050)
COVER DETAIL
(0.040)
BL 10
BL 30
STA 405
BRACKET
(0.50)
STA 400
ACCESS COVER
(0.040)
ACOUSTICAL FOAM
POLYMIDE FOAM
(0.50)
PLENUM
FIBERGLAS
(4 PLY)
BRACKET DOUBLER
(0.032)
BRACKFT
(0.50)

S 94366.3 (QF)

LOOKING DOWN - LEFT SIDE
WL 256

FIGURE 13-13 (SHEET 2 OF 3)

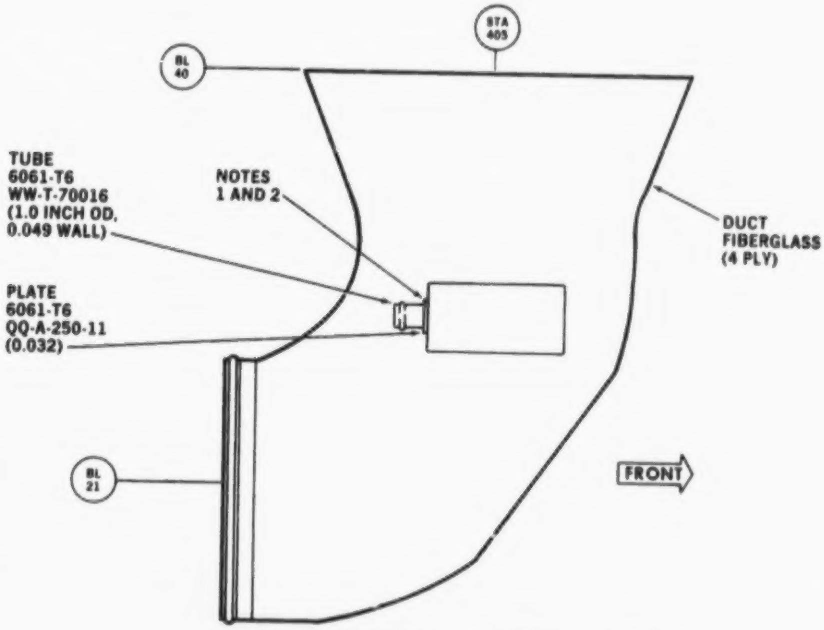
13-2.3 REPAIR ENVIRONMENTAL CONTROL SYSTEM DUCTING 13-2.3


ANGLE
(0.050)
COVER
(0.032)
ANGLE
2024-T3511
QQ-A-200-3
(0.050)
SPACER
(0.125)
DUCT
FIBERGLASS
(4 PLY)
DUCT
FIBERGLASS
(4 PLY)
ANGLE
(0.050)
FRONT
STRAP
(0.040)

LOOKING INBOARD - LEFT SIDE
STA 398-457-RIGHT SIDE OPPOSITE

S 94366.4 (QF)

C


STA
405
BL
40
TUBE
6061-T6
WW-T-70016
(1.0 INCH OD,
0.049 WALL)
NOTES
1 AND 2
DUCT
FIBERGLASS
(4 PLY)
PLATE
6061-T6
QQ-A-250-11
(0.032)
BL
21
FRONT

E

NOTES

1. TUBE AND PLATE ARE A WELDED ASSEMBLY PER MIL-W-8604, USING QQ-R-566, CL 404-3 FILLER WIRE. FORM BEFORE WELDING.
2. BOND TO DUCT USING EA934NA. INSTALL NAS1738B4-2 DURING BONDING PROCESS.

CONDENSER EXHAUST DUCT-LOOKING UP

S 94366.5 (QF)

FIGURE 13-13 (SHEET 3 OF 3)

13-3 HEATING AND VENTILATING BLOWER 13-3

PARAGRAPH BREAKDOWN

13-3.1 REPLACE BLOWER

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer

MATERIALS/PARTS

- Sealant, Item 303, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Nonmetallic Scraper, Locally-Made
- Torque Wrench, 30 - 150 in. lbs., GGG-W-00686

REFERENCES

- TM 55-1520-237-T

13-3.1 REPLACE BLOWER 13-3.1

REMOVE

a. Turn off all electrical power.

b. Unlatch and open main rotor pylon sliding fairing.

c. Disconnect blower electrical connector from mounted receptacle. Unclamp wiring from rear bracket.

d. Using a nonmetallic scraper, remove sealant from front flange of blower.

e. Remove bolts, washers, and nuts fastening blower to duct and muffler.

f Remove blower from helicopter.

INSTALL

g. Turn off all electrical power.

h. Inspect replacement blower and make sure impeller spins freely.

i. Place blower between duct and muffler so that air direction flow arrow points toward muffler. Line up boltholes in blower and duct flanges and fasten with bolts, washers, and nuts. **TORQUE NUTS TO 43 - 47 INCH-POUNDS.**

j. Connect blower electrical connector to mounted receptacle.

k. Attach blower wiring to rear bracket with bolt, washer, clamp, washer, and nut.

l. Apply a bead of sealant, Item 303, Appendix D, around front flange of blower.

m. Check heating/ventilating system operation (TM 55-1520-237-T).

n. Make sure area is free of foreign objects before closing up.

o. Close main rotor pylon sliding fairing.

13-3.1 REPLACE BLOWER 13-3.1

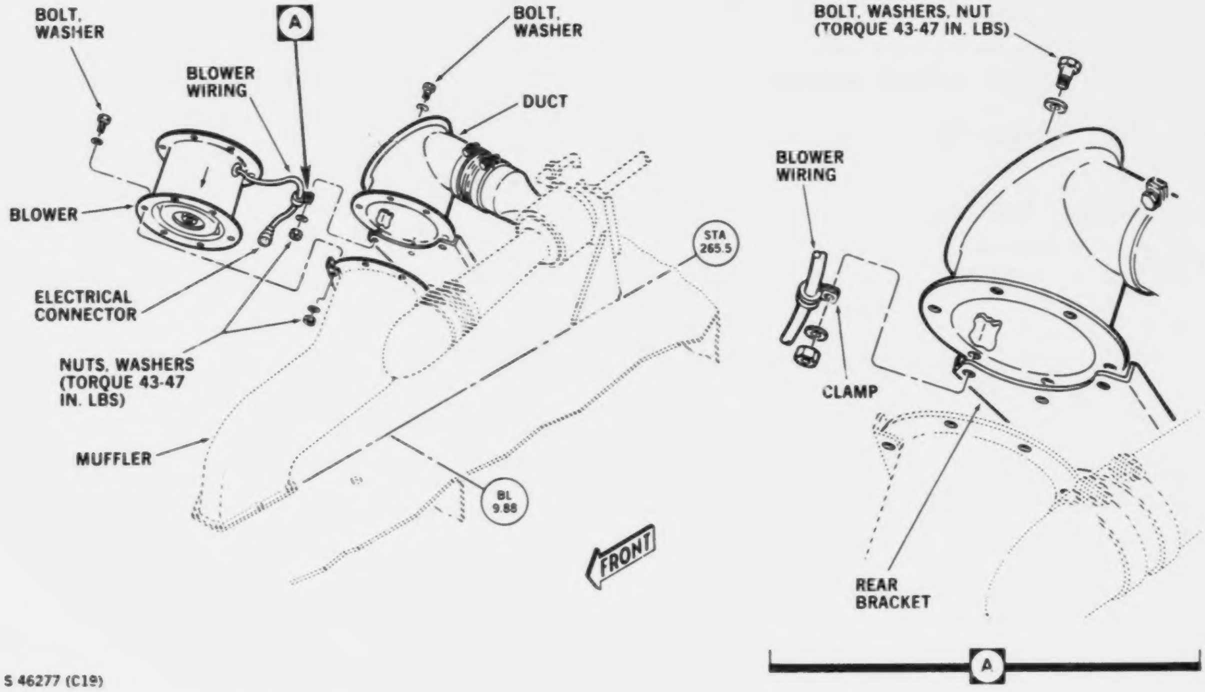

BOLT, WASHER
A
BOLT, WASHER
BLOWER WIRING
DUCT
BLOWER
STA 265.5
ELECTRICAL CONNECTOR
NUTS, WASHERS (TORQUE 43-47 IN. LBS)
MUFFLER
BL 9.88
FRONT
S 46277 (C19)
BOLT, WASHERS, NUT (TORQUE 43-47 IN. LBS)
BLOWER WIRING
CLAMP
REAR BRACKET
A

FIGURE 13-14

13-4 REPAIR BLOWER UNIT - (AVIM) 13-4

PARAGRAPH BREAKDOWN

13-4.1 REPAIR BLOWER UNIT (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68D - Aircraft Powertrain Repairer
- One: MOS 68F - Aircraft Electrical Repairer

MATERIALS/PARTS

- Lockwire, Item 198, Appendix D

TOOLS

- Aircraft Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Powertrain Repairer's Toolkit, SC 5180-99-CL-A13
- Torque Wrench, 30 - 150 in. lbs., GGG-W-00686

REFERENCES

- TM 55-1520-237-T
- TM 55-1500-323-24

13-4.1 REPAIR BLOWER UNIT (AVIM)

DISASSEMBLE BLOWER

a. Remove nut, washer and rotor from motor shaft.

b. Remove woodruff key from motor shaft.

c. Remove screw, washer, retainer, and valve-plate.

d. Disassemble electrical connector (TM 55-1500-323-24).

e. Remove screws and washers holding motor in stator.

f. Remove motor from stator.

INSPECT

g. Check rotor for bent, worn, or cracked blades.

h. Check wiring for signs of overheating. Check grommet for cracks.

i. Check stator for damage and cracks.

j. Check valve plate for broken springs, dented plates.

k. Check motor for signs of overheating. Motor shaft should turn freely.

l. Replace any unserviceable parts.

ASSEMBLE

m. Install electrical harness through grommet in stator.

n. Install motor in stator with screws. Lockwire, Item 198, Appendix D, screws.

o. Assemble electrical connector (TM 55-1500-323-24).

p. Install valve plate with retainer, screw, and washer.

q. Install Woodruff key, rotor on motor shaft with nut and washer. **TORQUE NUT TO 60 - 100 INCH-POUNDS.**

r. Do an operational check of unit (TM 55-1520-237-T).

13-4.1 REPAIR BLOWER UNIT (AVIM) 13-4.1

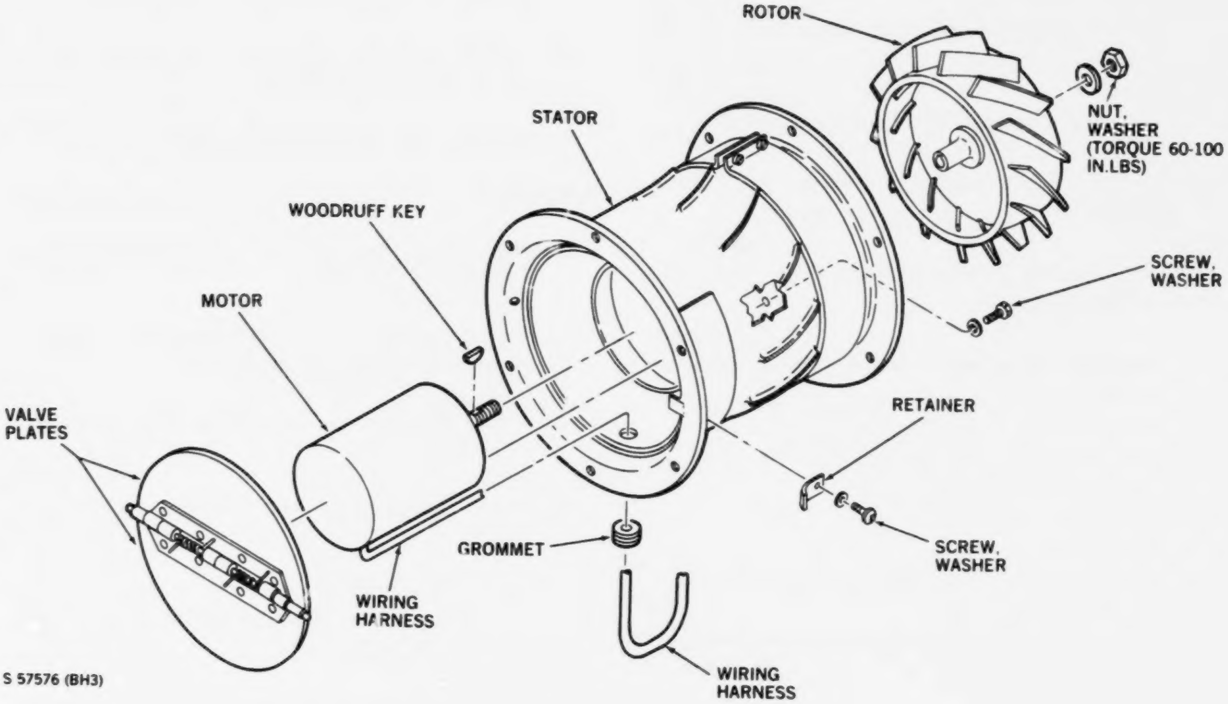

ROTOR
NUT,
WASHER
(TORQUE 60-100
IN.LBS)
STATOR
WOODRUFF KEY
SCREW,
WASHER
MOTOR
VALVE
PLATES
RETAINER
GROMMET
SCREW,
WASHER
WIRING
HARNESS
WIRING
HARNESS
S 57576 (BH3)

FIGURE 13-15

13-5 ENVIRONMENTAL CONTROL SYSTEM 13-5

PARAGRAPH BREAKDOWN

13-5.1	REPLACE PLENUM
13-5.2	REPLACE CONDENSER BLOWER
13-5.3	REPLACE CONDENSER ELECTRICAL HARNESS
13-5.4	REPLACE EVAPORATOR BLOWER
13-5.5	REPLACE EVAPORATOR ELECTRICAL HARNESS
13-5.6	REPLACE DUCTING
13-5.7	ADJUST BAFFLE ASSEMBLY

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68F - Aircraft Electrical Repairer
- One: MOS 68G - Aircraft Structural Repairer

MATERIALS/PARTS

- Adhesive, Item 35, Appendix D
- Adhesive, Item 422, Appendix D
- Aluminum Tape Item 413, Appendix D
- Cotter Pin, MS24665-151
- Rivets, MS20470AD
- Sealant, Item 303, Appendix D
- Sealing Compound, Item 312, Appendix D
- Tetrachloroethylene, Item 352, Appendix D

TOOLS

- Aircraft Mechanic's Toolkit, SC 5180-99-CL-A01
- Airframe Repairer's Toolkit, SC 5180-99-CL-A02
- Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Torque Wrench, 0 - 75 in. lbs., GGG-W-00686

REFERENCES

- PARA 2-32
- TM 55-1500-204-25/1

13-5.1 REPLACE PLENUM 13-5.1

REMOVE

a. Turn off all electrical power.

b. Remove left panel from rear cabin bulkhead (PARA 2-32).

c. Remove nut, washers, and clamp holding duct temperature sensor to right side of plenum. Carefully remove and stow sensor.

d. Loosen clamp securing flex duct to ambient air valve and pull duct off valve.

e. Remove valve operating lever that protrudes through bulkhead from ambient air valve.

f. Disconnect bracket on right side of plenum from bracket on frame.

g. Remove access cover from plenum.

h. Remove bolts and washers securing plenum to evaporator blower.

i. Using a putty knife, carefully separate plenum from evaporator blower.

j. Remove plenum from helicopter and discard old seal.

k. Remove rivets (TM 55-1500-204-25/1) holding ambient air valve assembly to plenum and remove.

INSTALL

l. Turn off all electrical power.

m. Attach ambient air valve assembly to new plenum with rivet, MS20470AD, manufactured head near side. Install washer under rivet bucked head.

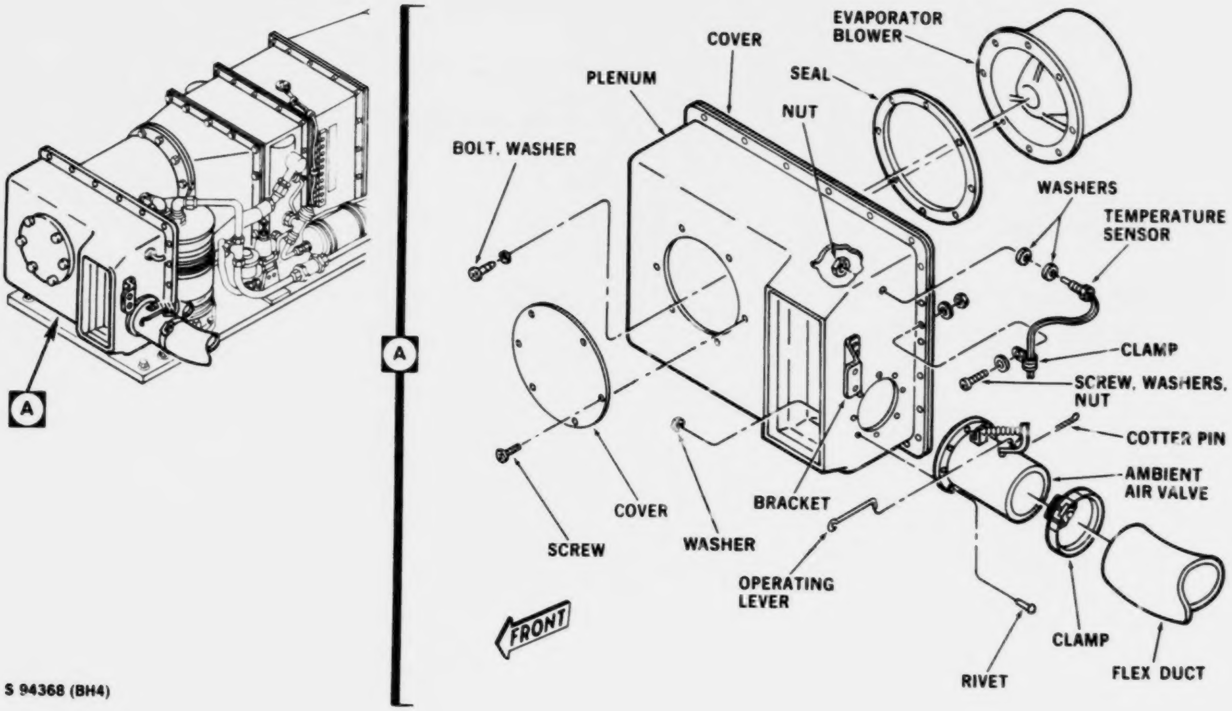

A
A
EVAPORATOR BLOWER
COVER
PLENUM
SEAL
NUT
BOLT, WASHER
WASHERS
TEMPERATURE SENSOR
CLAMP
SCREW, WASHERS, NUT
COTTER PIN
AMBIENT AIR VALVE
BRACKET
COVER
SCREW
WASHER
OPERATING LEVER
FRONT
CLAMP
RIVET
FLEX DUCT
S 94368 (BH4)

FIGURE 13-16

13-5.1 REPLACE PLENUM 13-5.1

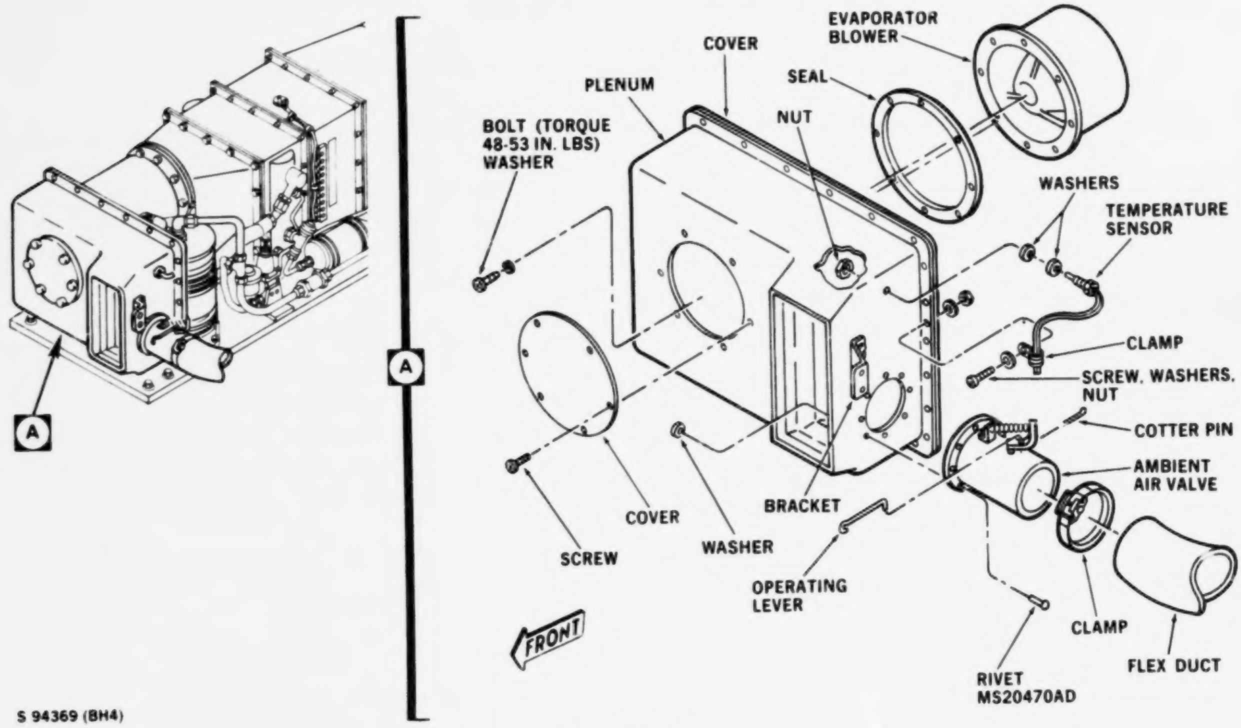

A
A
A
EVAPORATOR BLOWER
COVER
SEAL
PLENUM
NUT
BOLT (TORQUE 48-53 IN. LBS)
WASHER
WASHERS
TEMPERATURE SENSOR
CLAMP
SCREW, WASHERS, NUT
COTTER PIN
AMBIENT AIR VALVE
BRACKET
COVER
WASHER
SCREW
OPERATING LEVER
FRONT
CLAMP
FLEX DUCT
RIVET MS20470AD
S 94369 (BH4)

FIGURE 13-17

n. To bond new seals, do this:

  (1) Clean both sides of seals and sealing surfaces with tetrachloroethylene, Item 352, Appendix D. Wipe dry with a clean cloth.

  (2) Apply a light coat of adhesive, Item 422, Appendix D, to sealing surfaces and both sides of seals. Allow to air-dry for about 10 minutes or until adhesive is tacky.Install seal on evaporator blower.

o. Attach plenum to evaporator blower with bolts and washers. **TORQUE BOLTS TO 48 - 53 INCH-POUNDS.**

p. Attach plenum cover with screws.

q. Attach bracket on right side of plenum to airframe with screws, washers, and nuts.

r. Attach operating lever with cotter pin, MS24665-151.

s. Attach flex duct to ambient air inlet valve with clamp.

t. Install duct temperature sensor on right side of plenum with nut, washers, and clamp. **TIGHTEN NUT ON SENSOR 1/3 TO 1/6 TURN BEYOND POINT WHERE SHARP RISE IN TORQUE IS FELT.**

u. Install left panel on rear cabin bulkhead (PARA 2-32).

13-5.2 REPLACE CONDENSER BLOWER 13-5.2

REMOVE

a. Turn off all electrical power.

b. Remove right panel from rear cabin bulkhead (PARA 2-32).

c. Remove condenser exhaust duct (PARA 13-5.6).

d. Disconnect and remove electrical connector, P10, from blower.

e. Remove clamp holding forward end of blower and duct sleeve to cradle bracket.

f. Remove bolts and washers holding blower to condenser transition duct and support bracket. Remove blower from pallet.

g. Remove duct sleeve and install on new blower.

INSTALL

h. Turn off all electrical power.

i. Position blower on pallet. Make certain that gasket is positioned between support bracket and transition duct. Attach blower to transition duct and support bracket with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

j. Attach duct sleeve and forward end of blower to cradle bracket with clamp.

k. Attach electrical connector, P10, to blower.

l. Install condenser exhaust duct (PARA 13-5.6).

m. Install right panel on rear bulkhead (PARA 2-32).

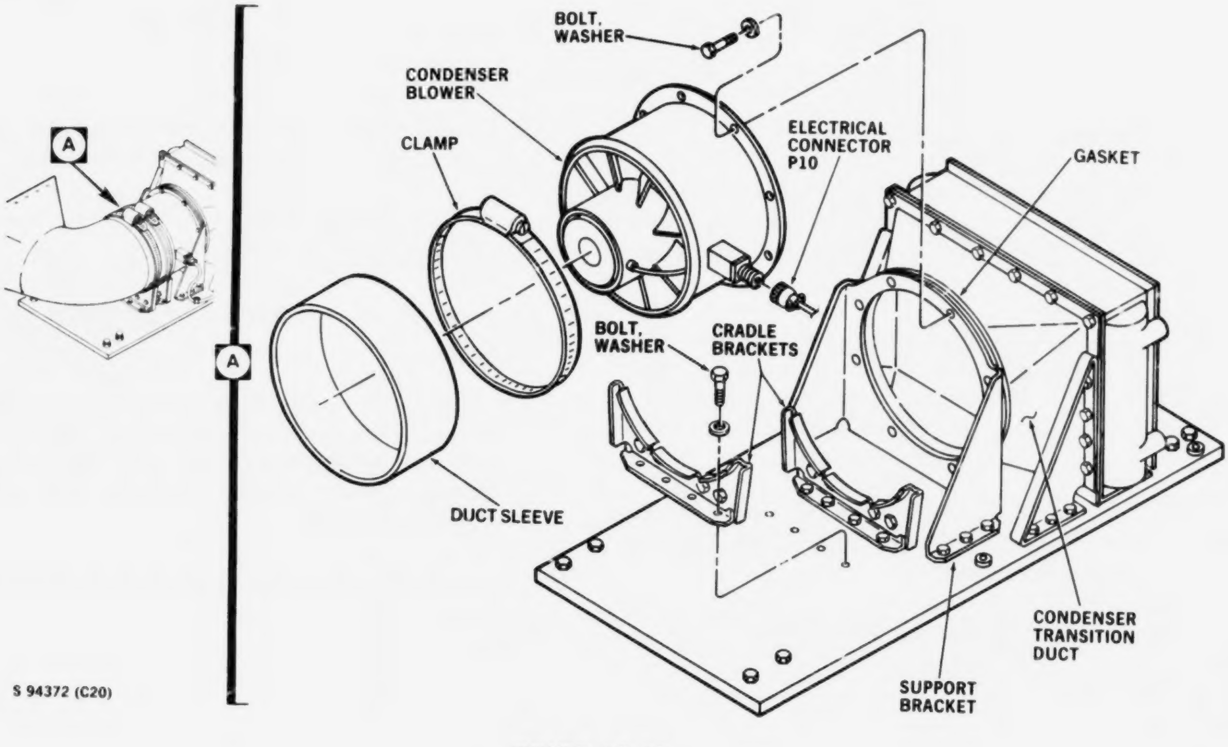

A
A
BOLT, WASHER
CONDENSER BLOWER
CLAMP
ELECTRICAL CONNECTOR P10
GASKET
BOLT, WASHER
CRADLE BRACKETS
DUCT SLEEVE
CONDENSER TRANSITION DUCT
SUPPORT BRACKET
S 94372 (C20)

FIGURE 13-18

13-5.3 REPLACE CONDENSER ELECTRICAL HARNESS 13-5.3

REMOVE

a. Turn off all electrical power.

b. Remove right panel from rear cabin bulkhead (PARA 2-32).

c. Remove condenser exhaust duct (PARA 13-5.6).

d. Disconnect electrical connector, P10, from condenser blower.

e. Remove clamps holding harness to pallet.

f. Disconnect electrical connector, P4, from electrical pallet.

g. Remove harness from pallet.

INSTALL

h. Connect electrical connector, P4, to electrical pallet.

i. Attach harness to pallet with screws, washers and clamps. **TORQUE SCREWS TO 20 - 25 INCH-POUNDS.**

j. Connect electrical connector, P10, to condenser blower.

k. Install condenser exhaust duct (PARA 13-5.6).

l. Install right panel on rear cabin bulkhead (PARA 2-32).

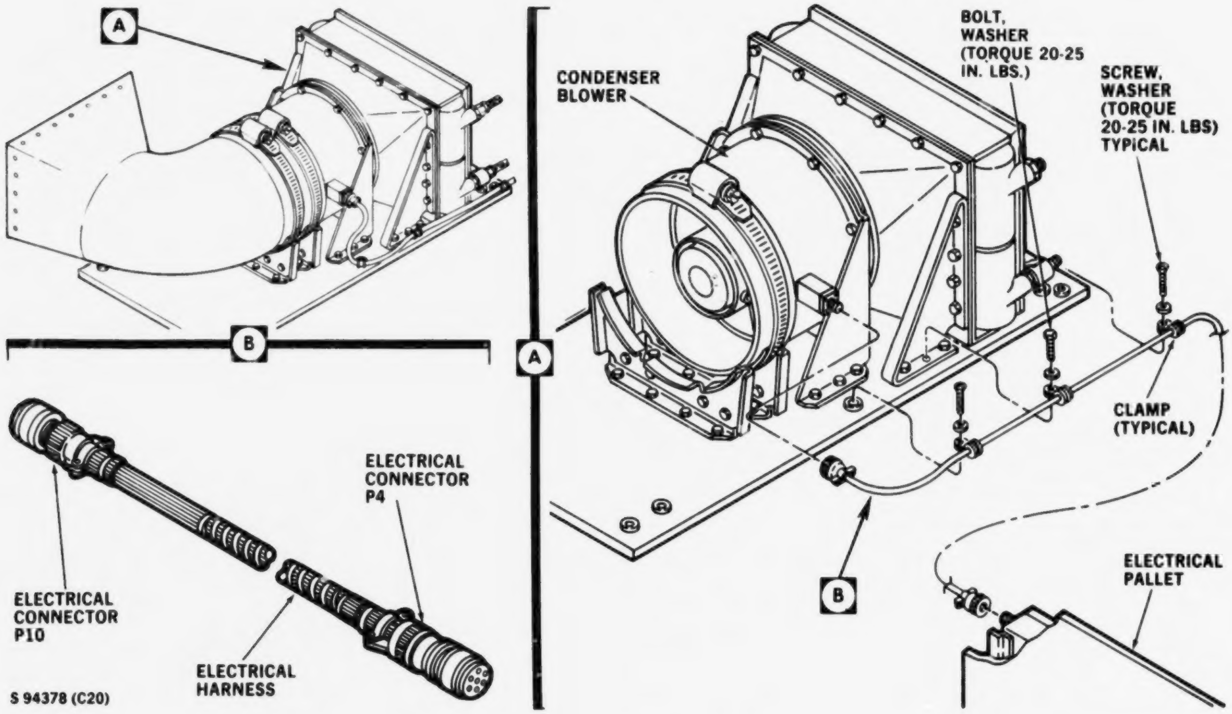

A
B
ELECTRICAL CONNECTOR P10
ELECTRICAL HARNESS
ELECTRICAL CONNECTOR P4
S 94378 (C20)
A
CONDENSER BLOWER
BOLT, WASHER (TORQUE 20-25 IN. LBS.)
SCREW, WASHER (TORQUE 20-25 IN. LBS) TYPICAL
CLAMP (TYPICAL)
B
ELECTRICAL PALLET

FIGURE 13-19

13-5.4 REPLACE EVAPORATOR BLOWER 13-5.4

REMOVE

a. Turn off all electrical power.

b. Remove left panel from rear cabin bulkhead (PARA 2-32).

c. Disconnect and remove electrical connector, P9, from evaporator blower.

d. Remove bolts and washers holding blower to rear of support bracket and evaporator inlet transition duct.

e. Remove blower from pallet.

INSTALL

f. Turn off all electrical power.

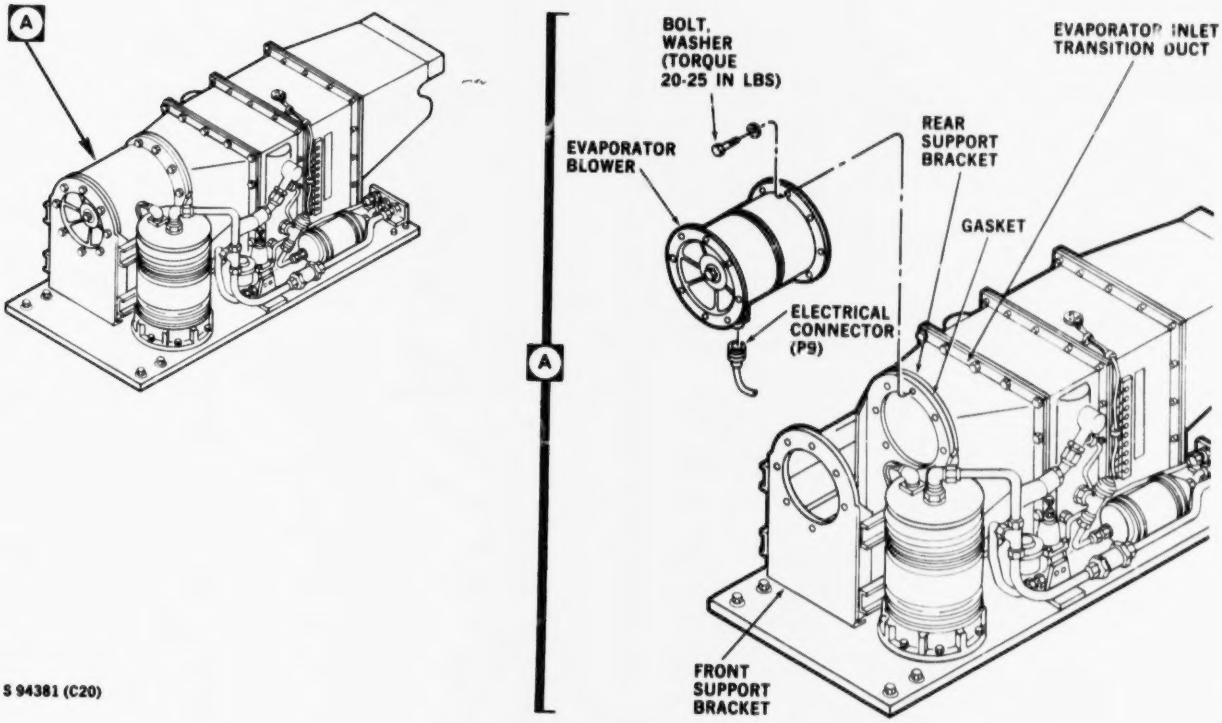
g. Attach blower to rear of support bracket and evaporator inlet transition duct with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

h. Make certain gasket is in place between rear support bracket and evaporator inlet transition duct.

i. Attach blower to front of support bracket with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

j. Attach electrical connector, P9, to blower.

k. Install left panel on rear cabin bulkhead (PARA 2-32).


A
BOLT, WASHER (TORQUE 20-25 IN LBS)
EVAPORATOR INLET TRANSITION DUCT
REAR SUPPORT BRACKET
EVAPORATOR BLOWER
GASKET
ELECTRICAL CONNECTOR (P9)
A
FRONT SUPPORT BRACKET

S 94381 (C20)

FIGURE 13-20

13-5.5 REPLACE EVAPORATOR ELECTRICAL HARNESS 13-5.5

REMOVE

a. Turn off all electrical power.

b. Remove left panel from rear cabin bulkhead (PARA 2-32).

c. Remove hot gas bypass valve (PARA 13-6).

d. Remove clamps securing harness to pallet and heater/demister.

e. Disconnect electrical connector, P9, from evaporator blower.

f. Disconnect electrical connector, P8, from compressor/motor.

g. Remove chaff guard and spiral wraps and separate out electrical leads for the hot gas bypass valve, thermistor, expansion valve and the heater/demister temperature switches.

h. Disconnect and tag all electrical leads on heater/demister terminal board, TB-4.

i. Disconnect and tag electrical leads to heater elements.

j. Remove harness from pallet.

INSTALL

k. Turn off all electrical power.

l. Remove tags and connect leads to heater elements.

m. Remove tags and connect leads to heater/demister terminal board, TB-4.

n. Connect electrical connector, P9, to evaporator blower.

o. Connect electrical connector, P8, to compressor/ motor.

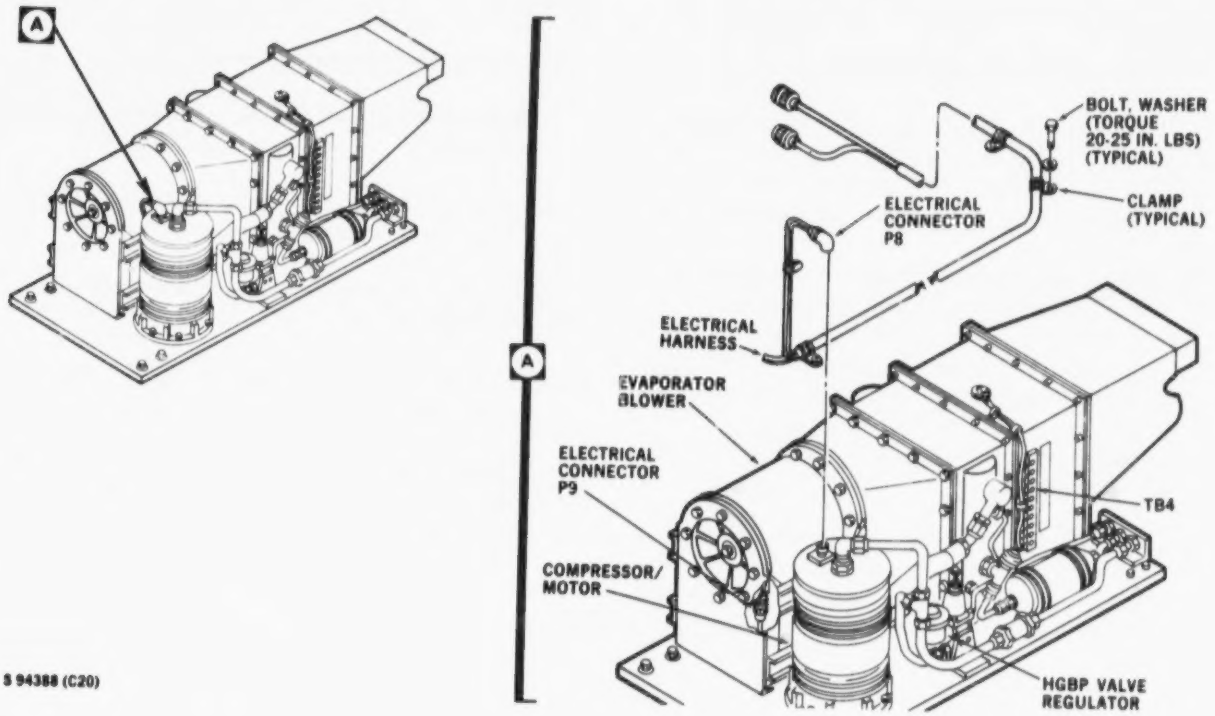
p. Remove chaff guard and spiral wraps and add leads for the hot gas bypass valve, thermistor, expansion valve and the heater/demister temperature switches to harness. Install spiral wraps and chaff guards.

q. Attach harness to pallet with screws, washers, and clamps. **TORQUE SCREWS TO 20 - 25 INCH-POUNDS.**

r. Install hot gas bypass valve (PARA 13-6).

s. Install left panel on rear cabin bulkhead (PARA 2-32).

13-5.5 REPLACE EVAPORATOR ELECTRICAL HARNESS 13-5.5


A
A
BOLT, WASHER (TORQUE 20-25 IN. LBS) (TYPICAL)
ELECTRICAL CONNECTOR P8
CLAMP (TYPICAL)
ELECTRICAL HARNESS
EVAPORATOR BLOWER
ELECTRICAL CONNECTOR P9
TB4
COMPRESSOR/ MOTOR
HGBP VALVE REGULATOR

S 94388 (C20)

FIGURE 13-21

13-5.6 REPLACE DUCTING 13-5.6

REMOVE CABIN DUCTING

NOTE

Except as noted, removal procedure is the same for the right and left ducts.

a. Turn off all electrical power.

b. Remove center and outboard headliner and rear cabin bulkhead panel as needed (PARA 2-32).

c. Loosen strap holding cabin duct to supply duct.

NOTE

Remove ducts from rear to front.

d. Support cabin duct and remove screws holding duct to isolator mounts.

e. Remove duct by carefully working cabin duct from supply duct connections.

INSTALL CABIN DUCTING

NOTE

Except as noted, procedure is the same for installing the right and left ducts.

f. Turn off all electrical power.

g. Position duct in cabin overhead. Slip cabin duct over supply duct. Attach strap with screw, washer.

h. Support duct and attach to isolator mounts with screws.

i. Install center and outboard headliner panels and rear cabin bulkhead panels (PARA 2-32).

REMOVE SUPPLY DUCTING

NOTE

Except as noted, removal procedure is the same for right and left ducts.

j. Turn off all electrical power.

k. Open avionics compartment access door.

l. Remove right and left rear bulkhead panels (PARA 2-32).

m. Remove strap holding cabin ducting to supply ducting.

n. In transition section, remove two clamps holding right flex duct to airframe, lower evaporator outlet duct and right supply duct.

o. Remove flex duct from helicopter.

p. Remove strap holding left supply duct to upper evaporator outlet duct.

q. Remove screws, washers, and nuts which hold support straps and hangers to airframe. Remove supply ducts from helicopter.

INSTALL SUPPLY DUCTING

NOTE

Except as noted, procedure is same for installing left and right ducts.

r. Turn off all electrical power.

s. To replace removed insulation, do this:

  (1) Clean surface of duct using a clean cloth dampened with tetrachloroethylene, Item 352, Appendix D. Wipe dry with clean cloth.

13-5.6 REPLACE DUCTING 13-5.6

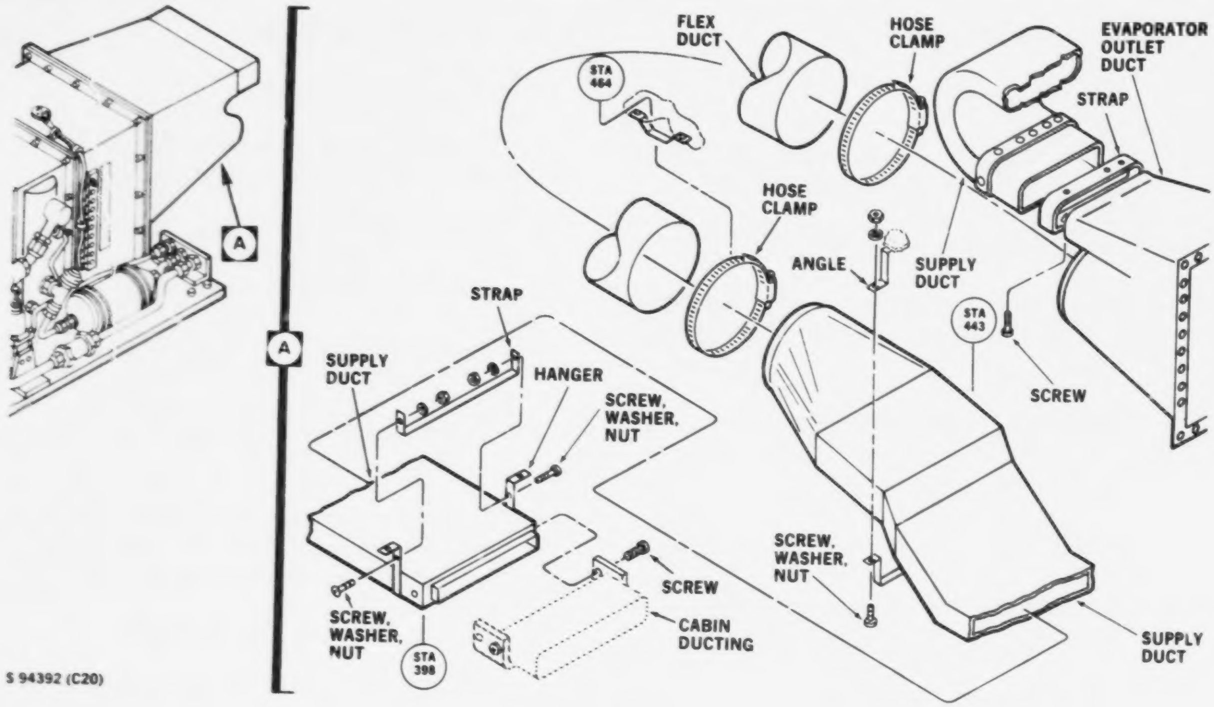

A
A
FLEX DUCT
HOSE CLAMP
EVAPORATOR OUTLET DUCT
STA 464
STRAP
HOSE CLAMP
ANGLE
SUPPLY DUCT
STA 443
SCREW
STRAP
SUPPLY DUCT
HANGER
SCREW, WASHER, NUT
SCREW, WASHER, NUT
SCREW
SCREW, WASHER, NUT
CABIN DUCTING
STA 398
SUPPLY DUCT
S 94392 (C20)

FIGURE 13-22

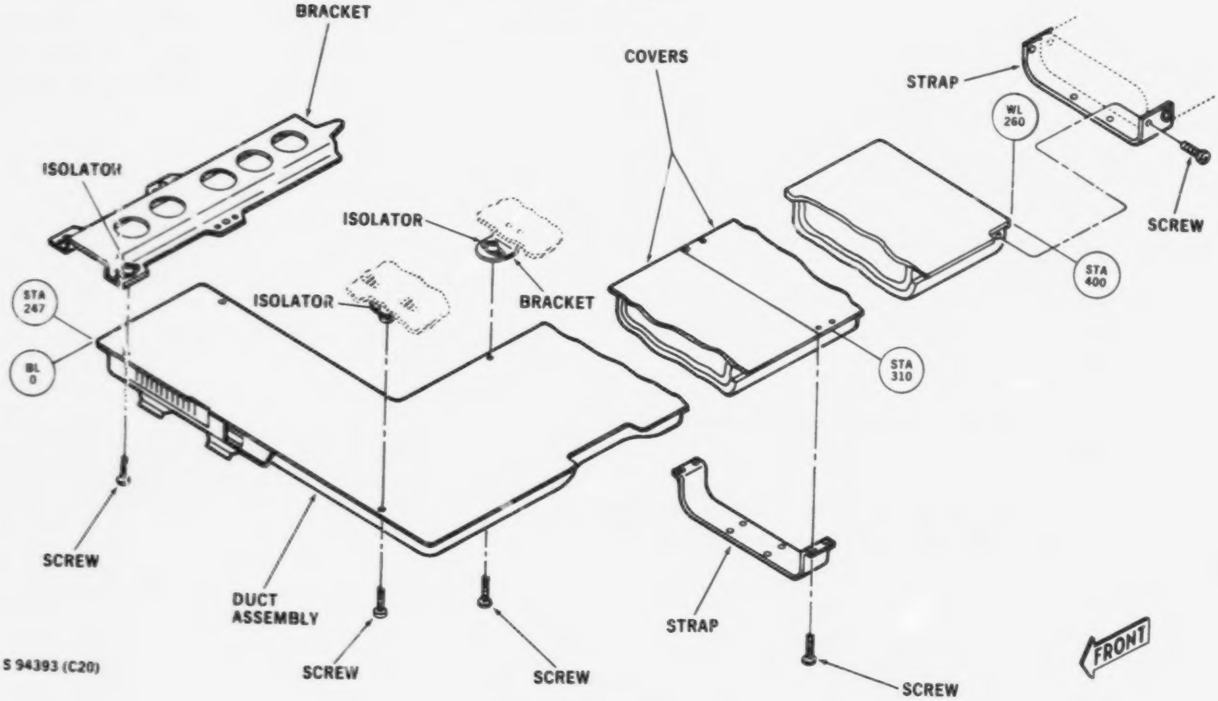

BRACKET
COVERS
STRAP
WL 260
ISOLATOR
ISOLATOR
SCREW
STA 400
ISOLATOR
BRACKET
STA 247
BL 0
STA 310
SCREW
DUCT ASSEMBLY
STRAP
FRONT
S 94393 (C20)
SCREW
SCREW
SCREW

FIGURE 13-23

13-5.6 REPLACE DUCTING 13-5.6

   (2) Seal all edges of new insulation with sealant, Item 303, Appendix D.

   (3) Apply a thin coat of adhesive, Item 35, Appendix D, to surfaces of duct and insulation.

   (4) Allow to air-dry for 10 minutes or until tacky.

   (5) Line up insulation and press into place.

   (6) Tape all joints with aluminum tape, Item 413, Appendix D.

t. To replace damaged insulation, do this:

   (1) Wrap insulation and patch with reinforced plastic film.

   (2) Apply a thin coat of adhesive, Item 35, Appendix D, to surfaces of duct and insulation.

   (3) Allow to air-dry for 10 minutes or until tacky.

   (4) Press film against insulation.

   (5) Tape joints and splices with aluminum tape.

u. Position supply ducts in helicopter and attach to airframe with straps, hangers, screws, washers, and nuts.

v. Attach left supply duct to upper evaporator outlet duct with strap.

w. Position flex duct in helicopter and attach to right supply duct, lower evaporator outlet duct, and airframe with clamps.

x. Connect supply ducting and cabin ducting. Install strap.

y. Install rear cabin bulkhead panels (PARA 2-32).

z. Close avionics compartment access door.

REMOVE CONDENSER EXHAUST DUCT

aa. Turn off all electrical power.

ab. Remove right rear cabin bulkhead panel (PARA 2-32).

ac. Open avionics compartment access door.

ad. Disconnect drain tube from bottom of duct.

ae. Remove screws and washers holding outlet end of duct to outlet screen flange.

af. Loosen clamp holding exhaust duct to condenser duct sleeve.

ag. Remove pallet mounting bolts.

ah. Slide pallet to rear position.

ai. Remove exhaust duct from helicopter.

INSTALL CONDENSER EXHAUST DUCT

aj. Turn off all electrical power.

ak. Apply a bead of sealing compound, Item 312, Appendix D, to outboard side of duct.

al. Position exhaust duct in helicopter and loosely install screws and washers in duct and outlet screen.

am. Connect drain tube to bottom of duct.

an. Connect duct sleeve to condenser with clamp.

ao. Tighten screws at outlet screen. **TORQUE SCREWS TO 20 - 25 INCH-POUNDS.**

ap. Install right rear cabin bulkhead panel (PARA 2-32).

aq. Close avionics access door.

13-5.6 REPLACE DUCTING 13-5.6

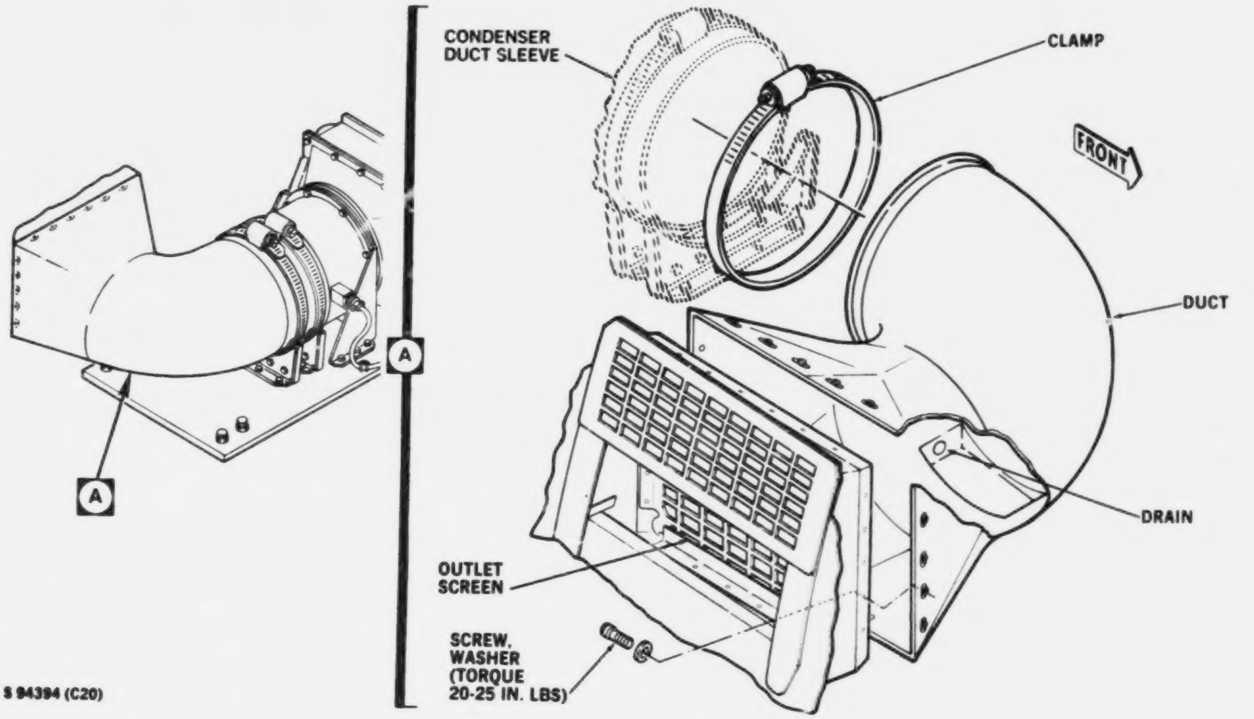
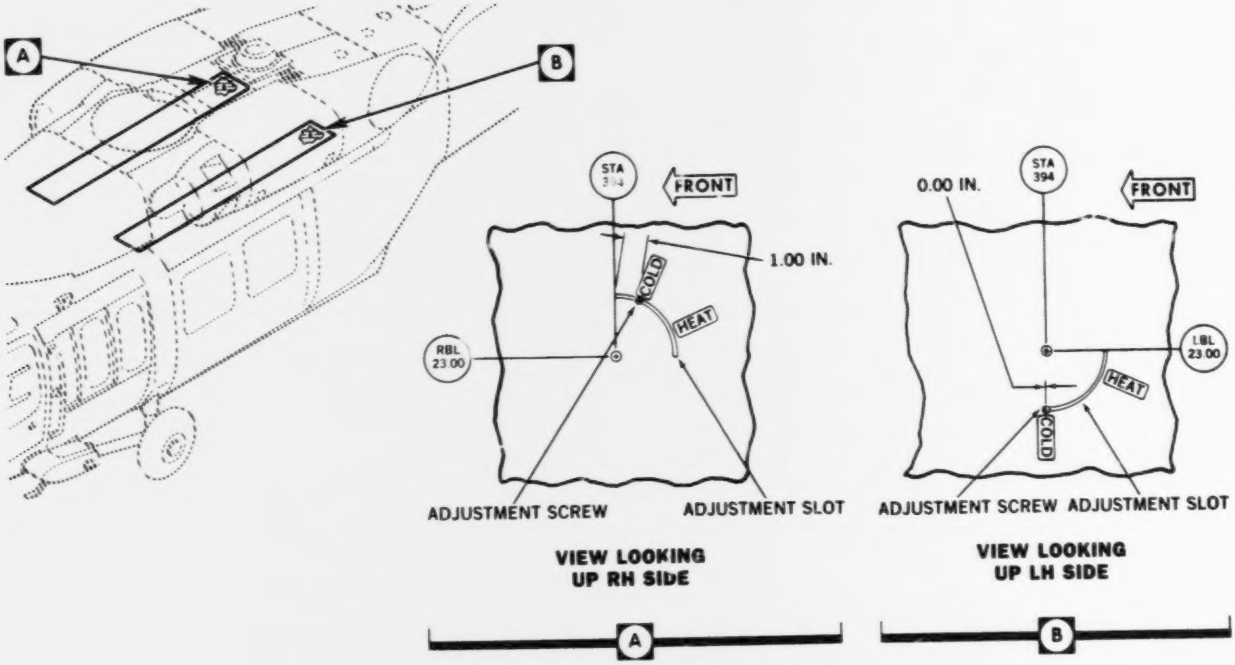

CONDENSER DUCT SLEEVE
CLAMP
FRONT
DUCT
A
A
DRAIN
OUTLET SCREEN
SCREW, WASHER (TORQUE 20-25 IN. LBS)
S 94394 (C20)

FIGURE 13-24

13-5.7 ADJUST BAFFLE ASSEMBLY 13-5.7


A
B
STA 394
FRONT
1.00 IN.
COLD
HEAT
RBL 23.00
ADJUSTMENT SCREW
ADJUSTMENT SLOT
0.00 IN.
STA 394
FRONT
LBL 23.00
HEAT
COLD
ADJUSTMENT SCREW
ADJUSTMENT SLOT
A
B

VIEW LOOKING UP RH SIDE

VIEW LOOKING UP LH SIDE

AIR CONDITIONING ADJUSTMENTS

S 134071.1 (BH3)

FIGURE 13-25 (SHEET 1 OF 2)

NOTE

The following ducting balance adjustment does not prohibit the use of the integral heater.

a. To adjust baffle assembly when air conditioning is to be used, do this:

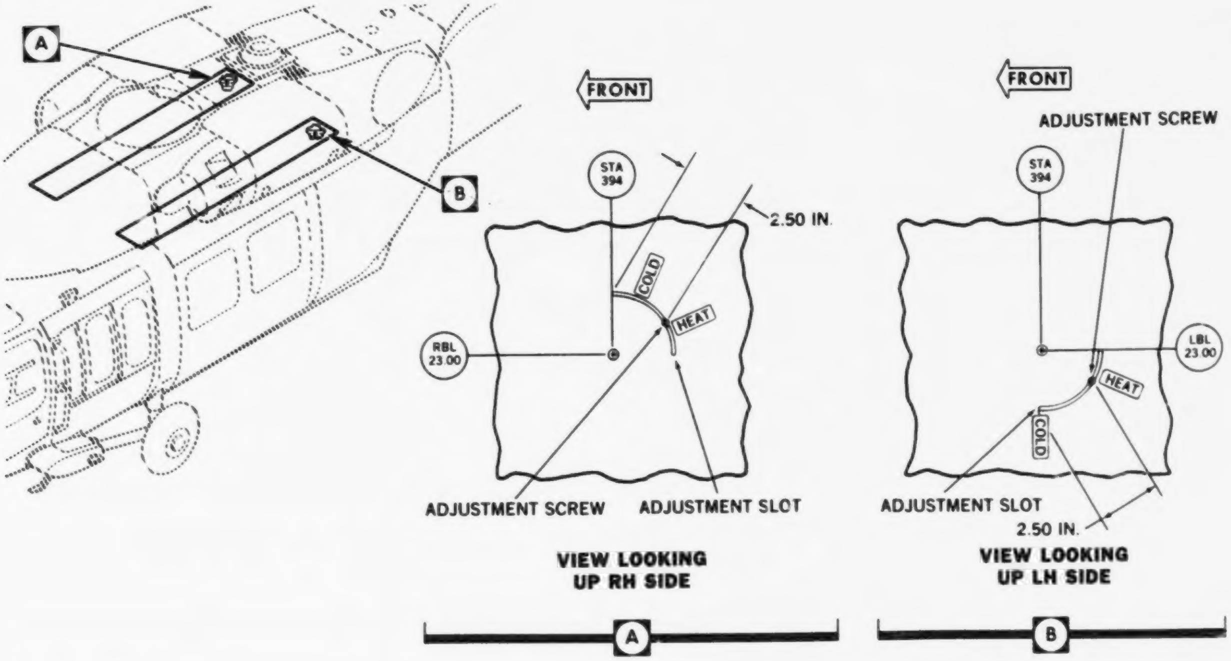
(1) Loosen adjustment screw on right supply duct baffle assembly. Move screw so that center of screw is 1 inch from COLD end of adjustment slot (Figure 13-25). Tighten screw.

(2) Loosen adjustment screw on left supply duct baffle assembly. Move screw until it touches COLD end of adjustment slot. Tighten screw.

NOTE

Make sure grip length of screws is not too long to prevent positive lock of baffles. Shim screws with washers if required.

13-5.7 ADJUST BAFFLE ASSEMBLY 13-5.7


A
B
FRONT
STA 394
2.50 IN.
COLD
HEAT
RBL 23.00
ADJUSTMENT SCREW
ADJUSTMENT SLOT
VIEW LOOKING UP RH SIDE
FRONT
ADJUSTMENT SCREW
STA 394
LBL 23.00
HEAT
COLD
ADJUSTMENT SLOT
2.50 IN.
VIEW LOOKING UP LH SIDE
A
B

S 134071.2 (BH3)

HEAT ADJUSTMENTS

FIGURE 13-25 (SHEET 2 OF 2)

NOTE

- The following ducting balance adjustment does not prohibit the use of air conditioning.
- Adjustment procedures for right and left baffle assemblies is the same.

b. To adjust right and left baffle assemblies when heat is to be used, loosen adjustment screw on supply duct baffle assembly. Move screw so that center of screw is 2.50 inches from COLD end of adjustment slot (Figure 13-25). Tighten screw.

NOTE

Make sure grip length of screws is not too long to prevent positive lock of baffles. Shim screws with washers if required.

13-6 ENVIRONMENTAL CONTROL SYSTEM (ECS) - REPAIR (AVIM) 13-6

PARAGRAPH BREAKDOWN

13-6.1 REPLACE CONDENSER PALLET (AVIM)
13-6.2 REPLACE LINES, BURST DISC, AND RELIEF VALVE (AVIM)
13-6.3 REPLACE CONDENSER AND TRANSITION DUCT (AVIM)
13-6.4 REPLACE EVAPORATOR PALLET (AVIM)
13-6.5 REPLACE COMPRESSOR (AVIM)
13-6.6 REPLACE HOT GAS BYPASS (HGBP) VALVE (AVIM)
13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM)
13-6.8 REPLACE ELECTRICAL PALLET (AVIM)
13-6.9 REPLACE SERVICING MANIFOLD (AVIM)
13-6.10 REPLACE SIGHT GLASS (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 52C - Utility Equipment Repairer

MATERIALS/PARTS

- Cap, NAS 817-4
- Cap, NAS 817-6
- Cap, NAS 817-8
- Cap, NAS 817-10
- Cap, NAS 817-12
- Compressor Oil, Item 118, Appendix D
- Lockwire, Item 199, Appendix D
- Loctite, Item 396, Appendix D
- Nitrogen, Item 242, Appendix D
- Packing, NAS1595-04
- Packing, NAS1595-08
- Packing, NAS1595-10
- Packing, NAS1611-115
- Plug, NAS818-4
- Plug, NAS818-6
- Plug, NAS818-8
- Plug, NAS818-10
- Plug, NAS818-12
- Refrigerant Item 281, Appendix D
- Sealant, Item 303, Appendix D
- Sealing Compound, Item 312, Appendix D

TOOLS

- Empty Container, 3-gallon, Locally-Procured
- Empty Container, 5-gallon, Locally-Procured
- Gloves and Goggles, Locally-Procured
- Nonmetallic Scraper, Locally-Made
- Refrigeration Unit Service Toolkit, SC 5180-90-CL-N18
- Torque Wrench, 0 - 75 in. lbs., GGG-W-00686
- Torque Wrench, 0 - 300 in. lbs., GGG-W-00686
- Torque Wrench, 0 - 600 in. lbs., GGG-W-00686
- Wrench, Open End, 1-1/8 inch, GGG-W-636
- Wrench, Open End, 1-1/4 inch, GGG-W-636

REFERENCES

- PARA 1-4.1
- PARA 2-32
- TM 55-1520-237-T

13-6.1 REPLACE CONDENSER PALLET (AVIM) 13-6.1

REMOVE

a. Turn off all electrical power.

b. Open avionics compartment access door.

c. Deservice ECS (PARA 1-4.1).

d. Remove right panel from rear cabin bulkhead (PARA 2-32).

e. Remove condenser exhaust duct (PARA 13-5)

f. Disconnect and remove electrical connector, P4, from right side of electrical pallet.

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

g. Disconnect and remove refrigerant hose assemblies from condenser inlet and outlet fittings. Plug, NAS818-8 and NAS818-10, hoses and cap, NAS817-8 and NAS817-10, fittings.

h. Remove bolts and washers holding pallet to support channel.

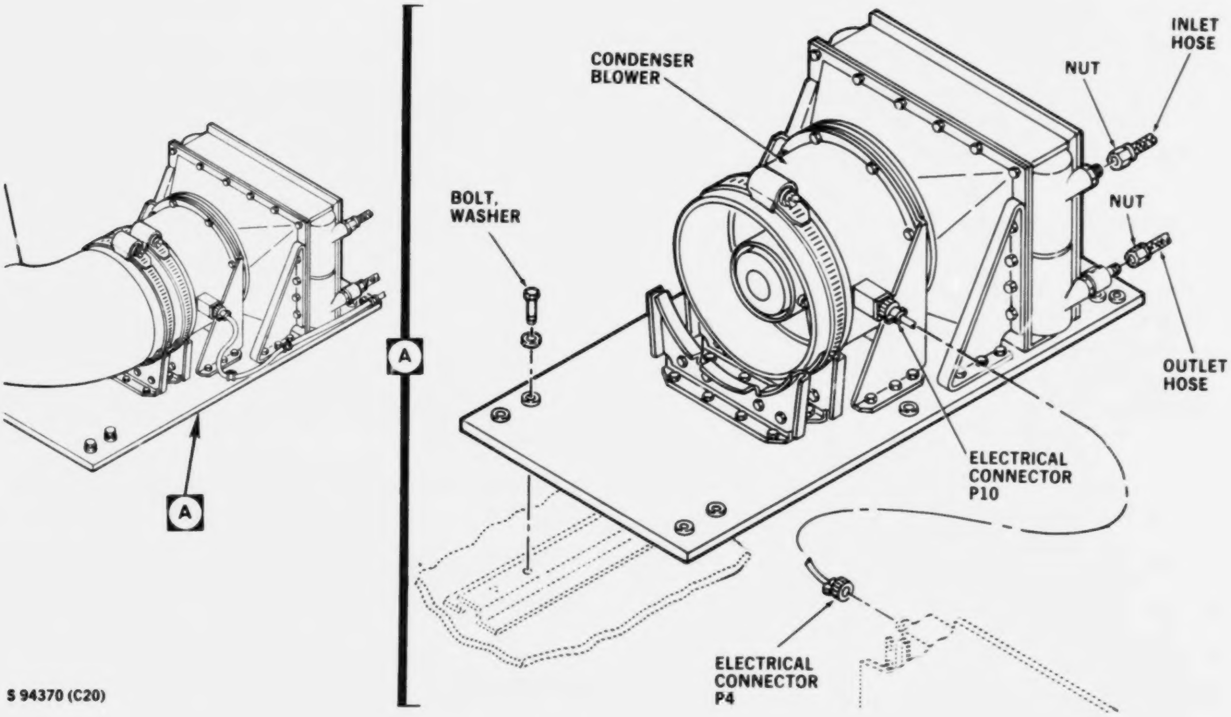

A
A
BOLT, WASHER
CONDENSER BLOWER
NUT
INLET HOSE
NUT
OUTLET HOSE
ELECTRICAL CONNECTOR P10
ELECTRICAL CONNECTOR P4
S 94370 (C20)

FIGURE 13-26

13-6.1 REPLACE CONDENSER PALLET (AVIM) 13-6.1

CAUTION

To prevent damage to ECS, do not use lines, fittings, or other components as a handhold. Handle pallet by base only.

i. Remove pallet from helicopter.

j. Remove bolts, washers, and support channels from airframe.

INSTALL

k. Turn off all electrical power.

l. To pressure test pallet before installation do this:

WARNING

- To prevent injury to personnel, observe the following safety precautions when working on any part of the air conditioning system.
- Protect skin and eyes from possible contact with liquid refrigerant. Wear gloves and goggles. Keep your body as well protected as you can from possible contact with liquid refrigerant.
- If liquid refrigerant comes in contact with the eyes or skin, get immediate medical aid.
- The refrigerant in a sealed system is always under pressure. Do not disconnect any line or component of the pressurized cooling system without first carefully releasing the pressure.
- Freon-500 will displace air and can cause suffocation, even though it is nontoxic. It will produce highly toxic phosgene gas if exposed to open flame. Make sure work area is well ventilated, and that there are no open flames, or unshielded heaters in immediate area.
- The use of heat on any part of the pressurized system will cause a pressure buildup and could cause an explosion. Do not try to solder or weld any part of the system while the system is charged with refrigerant.

(1) Connect low pressure (blue) hose to VAC side of servicing manifold and the high pressure (red) hose to REF side of the servicing manifold. Make sure manifold hand wheels are closed.

(2) Uncap condenser inlet and connect high pressure (red) hose.

(3) Connect yellow hose to Freon-500 bottle and spare vacuum gage.

NOTE

Make sure Freon-500 bottle is positioned up right so only vapors will transfer.

(4) Open valve on Freon-500 bottle and record the bottle pressure.

(5) Close valve on Freon-500 bottle and disconnect yellow hose from spare vacuum gage.

(6) Connect end of yellow hose to REF side of servicing manifold.

(7) Open Freon-500 bottle valve.

13-6.1 REPLACE CONDENSER PALLET (AVIM) 13-6.1

(8) Purge yellow hose of air by loosening fitting at servicing manifold until a little freon vapor comes out. Immediately tighten fitting.

(9) Open REF hand wheel until low pressure gage equals freon bottle pressure.

(10) Close REF hand wheel and freon bottle valve. Disconnect yellow hose from Freon-500 bottle.

(11) Connect yellow hose to regulated dry nitrogen, Item 242, Appendix D, source.

(12) Slowly increase regulator pressure until it equals system pressure or slightly higher.

(13) Open REF hand wheel and slowly, increase system pressure to 300 psig.

(14) Using a Halogen leak detector calibrated to detect leaks of 2 oz./year or less, check all fittings, connections, hoses and components for leaks. Repair as necessary.

(15) Repeat until no leaks are found.

(16) Close REF hand wheel on servicing manifold.

(17) Close nitrogen valve. Disconnect yellow hose from nitrogen regulator fitting and place loose end into a clean 5-gallon container, 1/4-full of water.

(18) Slowly open REF hand wheel and drain system until no bubbles appear in container. Pressure gage should read 0 psig.

(19) Close REF hand wheel and disconnect yellow hose.

(20) Disconnect high pressure (red) hose from condenser inlet.

(21) Immediately cap inlet fitting.

m. Install support channels on airframe with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

CAUTION

To prevent damage to ECS, do not use lines, fittings, or other components as a handhold. Handle pallet by base only.

n. Position pallet over fuel cells and attach to support channels with bolts and washers. **TORQUE BOLTS TO 50 - 70 INCH-POUNDS.**

o. Remove caps and plugs.

p. Connect refrigerant hose assemblies to condenser inlet and outlet fittings. Lubricate nuts with compressor oil, Item 118, Appendix D. **TORQUE INLET (UPPER) NUT TO 200 - 300 INCH-POUNDS. TORQUE OUTLET (LOWER) NUT TO 150 - 250 INCH-POUNDS.**

q. Connect electrical connector, P4, to right side of electrical pallet.

r. Install condenser exhaust duct (PARA 13-5).

s. Service ECS (PARA 1-4.1).

t. Do operational check on ECS (TM 55-1520-237-T).

u. Install right panel on rear cabin bulkhead (PARA 2-32).

v. Close avionics access door.

13-6.1 REPLACE CONDENSER PALLET (AVIM) 13-6.1

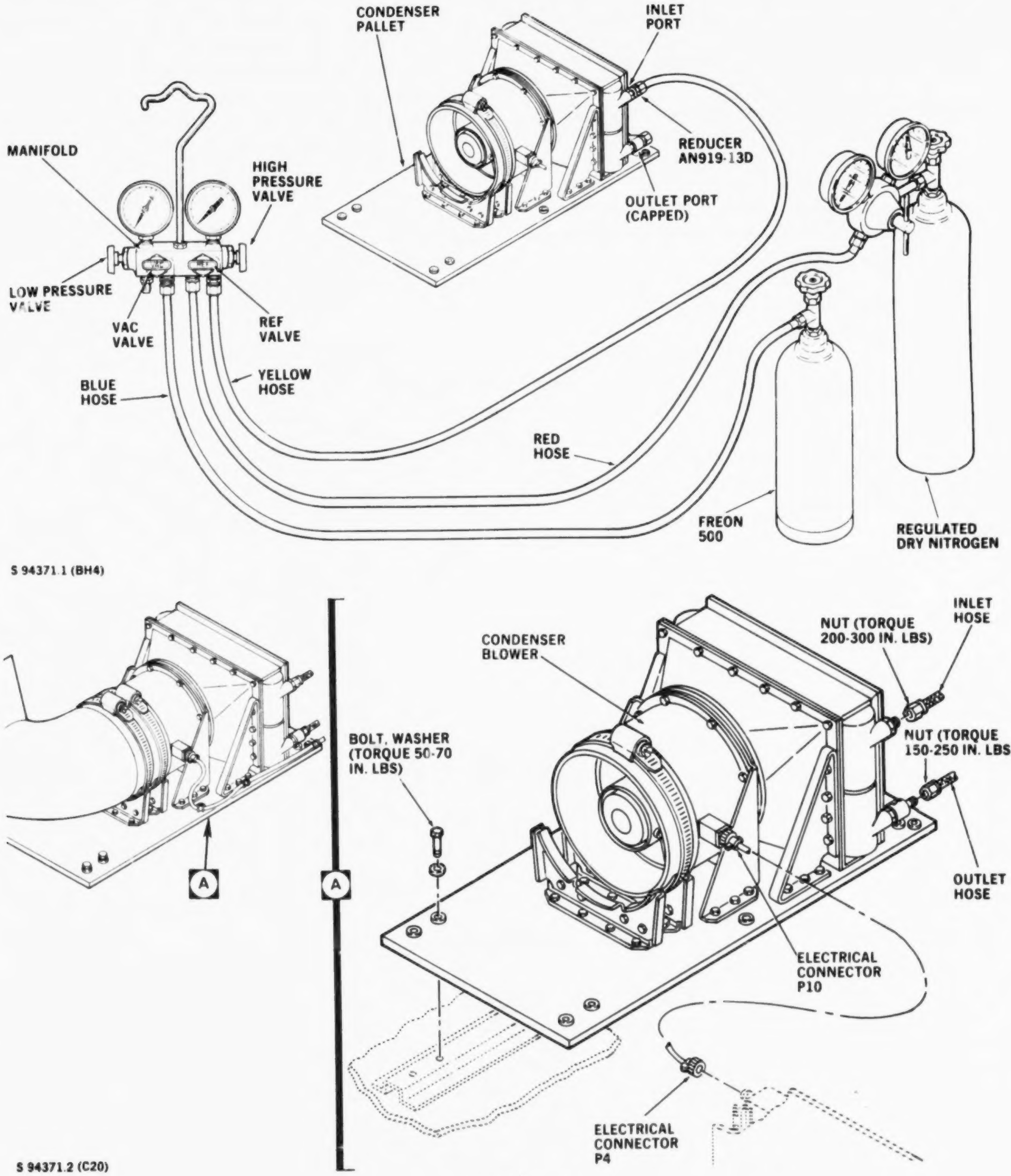

CONDENSER PALLET
INLET PORT
REDUCER AN919-13D
OUTLET PORT (CAPPED)
MANIFOLD
HIGH PRESSURE VALVE
LOW PRESSURE VALVE
VAC VALVE
REF VALVE
BLUE HOSE
YELLOW HOSE
RED HOSE
FREON 500
REGULATED DRY NITROGEN
S 94371.1 (BH4)
CONDENSER BLOWER
NUT (TORQUE 200-300 IN. LBS)
INLET HOSE
NUT (TORQUE 150-250 IN. LBS)
OUTLET HOSE
BOLT, WASHER (TORQUE 50-70 IN. LBS)
A
A
ELECTRICAL CONNECTOR P10
ELECTRICAL CONNECTOR P4
S 94371.2 (C20)

FIGURE 13-27

13-6.2 REPLACE LINES, BURST DISC, AND RELIEF VALVE (AVIM) 13-6.2

REMOVE

a. Deservice ECS (PARA 1-4.1).

b. Remove bolts, washers, clamps and bushing holding over pressurization line to pallet.

c. Loosen nut at tee on condenser outlet.

d. Slide outboard end of line from grommet in transition duct.

e. Remove line from pallet.

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

f. Immediately install plug, NAS818-6, on line and place cap, NAS817-6, on tee connection at condenser outlet.

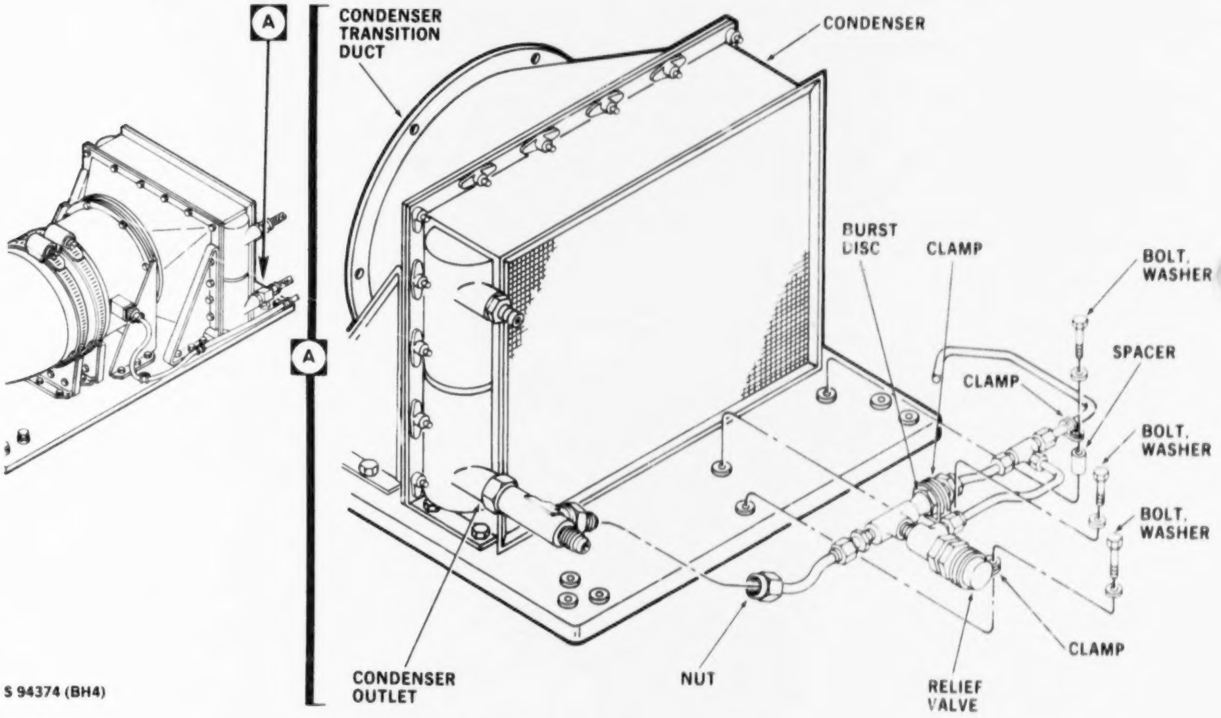

A
A
CONDENSER TRANSITION DUCT
CONDENSER
BURST DISC
CLAMP
BOLT, WASHER
SPACER
CLAMP
BOLT, WASHER
BOLT, WASHER
CLAMP
CONDENSER OUTLET
NUT
RELIEF VALVE
S 94374 (BH4)

FIGURE 13-28

13-6.2 REPLACE LINES, BURST DISC, AND RELIEF VALVE (AVIM) 13-6.2

INSTALL

g. Apply Loctite, Item 396, Appendix D, to burst disc inlet and outlet fittings and relief valve inlet fitting. Lubricate other nuts with compressor oil, Item 118, Appendix D.

h. Loosely assemble lines, tees, burst disc, and valve.

i. Slide outboard end of line assembly into grommet in transition duct.

j. Attach lines, burst disc, and relief valve to pallet with bolts, washers, clamps and bushing. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

k. Lubricate remaining nut with compressor oil, Item 118, Appendix D, and loosely connect to condenser outlet tee.

l. **TORQUE ALL TUBING NUTS TO 75 - 125 INCH-POUNDS.**

m. Service ECS (PARA 1-4.1).

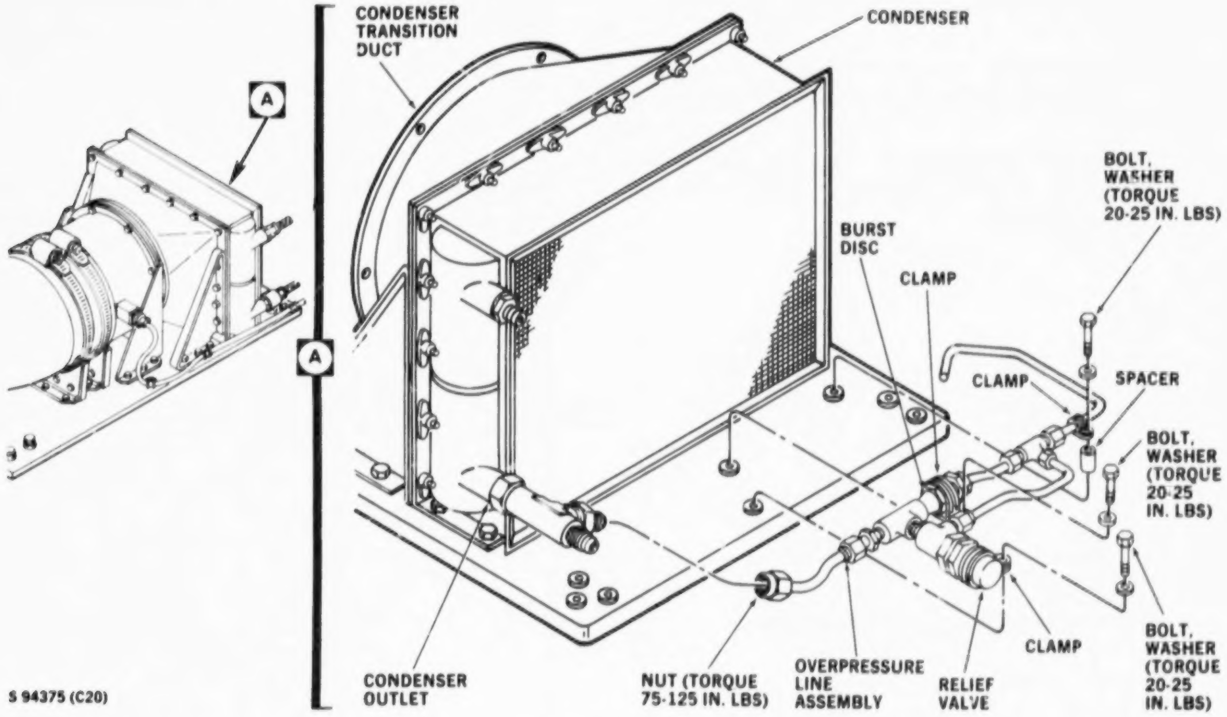

A
A
CONDENSER TRANSITION DUCT
CONDENSER
BOLT, WASHER (TORQUE 20-25 IN. LBS)
BURST DISC
CLAMP
CLAMP
SPACER
BOLT, WASHER (TORQUE 20-25 IN. LBS)
CLAMP
BOLT, WASHER (TORQUE 20-25 IN. LBS)
S 94375 (C20)
CONDENSER OUTLET
NUT (TORQUE 75-125 IN. LBS)
OVERPRESSURE LINE ASSEMBLY
RELIEF VALVE

FIGURE 13-29

13-6.3 REPLACE CONDENSER AND TRANSITION DUCT (AVIM) 13-6.3

REMOVE

a. Deservice ECS (PARA 1-4.1).

b. Remove condenser blower (PARA 13-5).

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

c. Loosen nut at tee on condenser outlet. Cap, NAS817-6, fitting and plug, NAS818-6, line.

d. Remove bolt, washer, bushing and clamp holding over pressurization line at outboard side of pallet.

e. Loosen nut at tee and remove over pressurization line from grommet in transition duct. Cap, NAS817-6, fitting and plug, NAS818-6, line.

f. Remove brackets from pallet.

g. Break seal between condenser and pallet, and remove condenser and transition duct from pallet.

h. Remove screws, washers, and transition duct from condenser.

i. Remove sealing compound from transition duct mating flange and pallet with a nonmetallic scraper.

INSTALL

j. Seal interface of condenser and transition duct with sealing compound, Item 312, Appendix D.

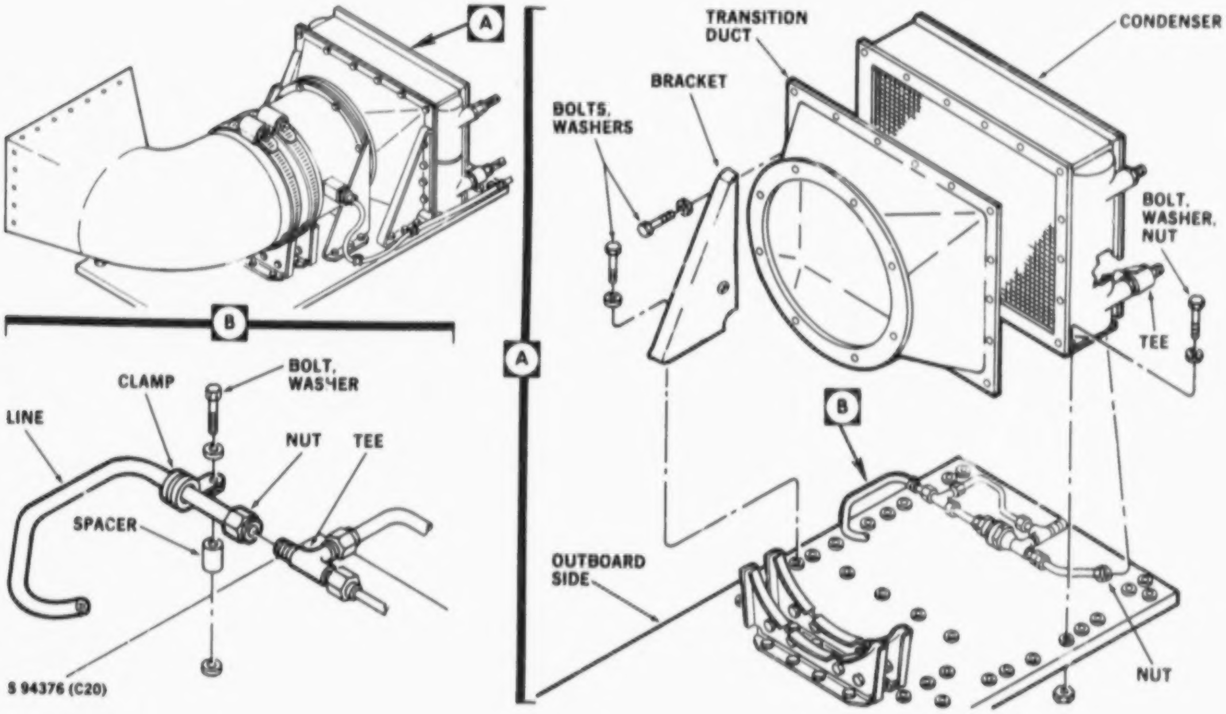

A
B
CLAMP
BOLT, WASHER
LINE
NUT
TEE
SPACER
S 94376 (C20)
A
TRANSITION DUCT
CONDENSER
BRACKET
BOLTS, WASHERS
BOLT, WASHER, NUT
TEE
B
OUTBOARD SIDE
NUT

FIGURE 13-30

13-6.3 REPLACE CONDENSER AND TRANSITION DUCT (AVIM) 13-6.3

k. Attach transition duct to condenser with screws and washers. **TORQUE SCREWS TO 20 - 25 INCH-POUNDS.**

l. Seal interface of condenser and pallet with sealing compound, Item 312, Appendix D.

m. Attach brackets to pallet with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

n. Attach brackets to condenser with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

o. Slide over pressurization line into grommet in transition duct.

p. Attach nut to tee. Lubricate nut with compressor oil, Item 118, Appendix D. **TORQUE NUT TO 75 - 125 INCH-POUNDS.**

q. Attach over pressurization line to pallet with bolt, washer, bushing, and clamp. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

r. Lubricate remaining nut with compressor oil, Item 118, Appendix D, and connect to tee at condenser outlet. **TORQUE NUT TO 75 - 125 INCH-POUNDS.**

s. Replace condenser blower (PARA 13-5).

t. Pressure test condenser pallet (PARA 13-6.1).

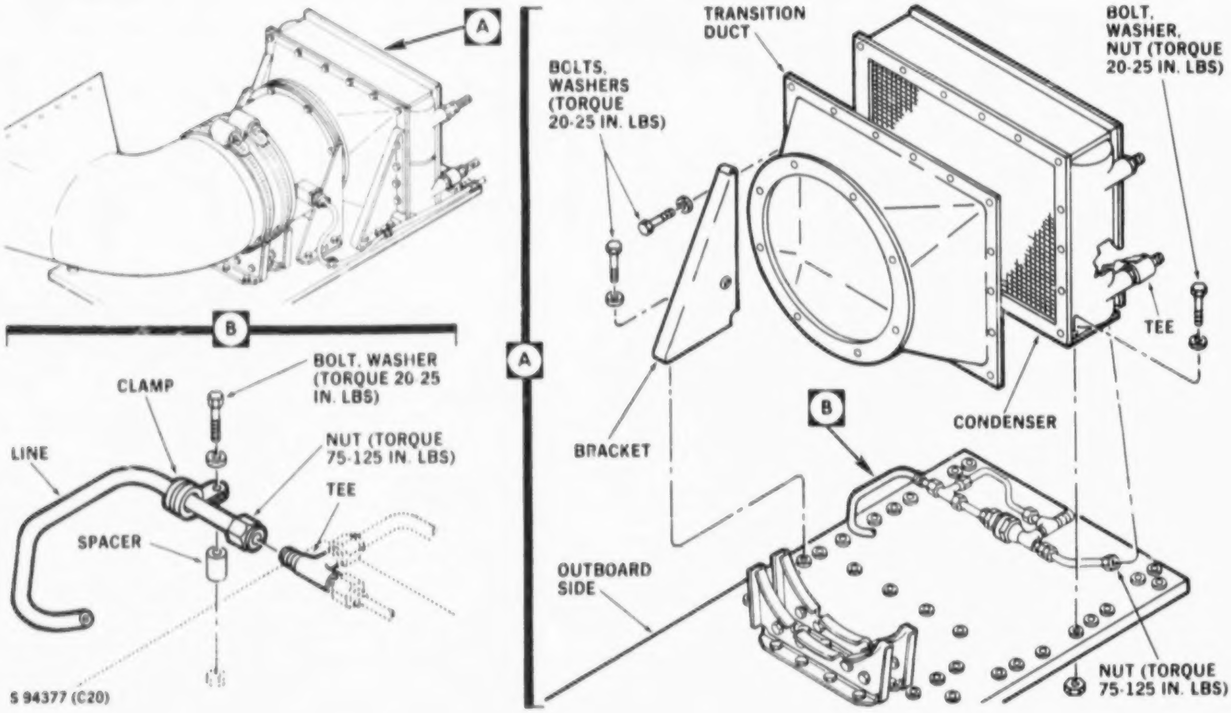

A
B
BOLT, WASHER (TORQUE 20-25 IN. LBS)
CLAMP
LINE
NUT (TORQUE 75-125 IN. LBS)
TEE
SPACER
S 94377 (C20)
A
TRANSITION DUCT
BOLTS, WASHERS (TORQUE 20-25 IN. LBS)
BOLT, WASHER, NUT (TORQUE 20-25 IN. LBS)
TEE
B
CONDENSER
BRACKET
OUTBOARD SIDE
NUT (TORQUE 75-125 IN. LBS)

FIGURE 13-31

13-6.4 REPLACE EVAPORATOR PALLET (AVIM) 13-6.4

REMOVE

a. Turn off all electrical power.

b. Open avionics compartment access door.

c. Deservice ECS (PARA 1-4.1).

d. Remove left panel from rear cabin bulkhead (PARA 2-32).

e. Remove plenum (PARA 13-5).

f. Disconnect and remove electrical connectors, P3 and P7, from left side of electrical pallet.

g. Loosen clamps holding lower ducting to evaporator outlet transition duct. Slide duct off evaporator outlet transition duct.

h. Remove strap holding upper supply ducting to evaporator outlet transition duct. Slide duct off evaporator outlet transition duct.

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

i. Disconnect outlet line at left rear of pallet. Disconnect inlet line and equalization line at connection near electrical pallet. Cap, NAS817-4, NAS817-8, and NAS817-10, fittings and plug, NAS818-4, NAS818-8, and NAS818-10, hoses.

j. Remove bolts and washers holding pallet to support channels.

CAUTION

To prevent damage to ECS, do not use lines, fittings, or other components as a handhold. Handle pallet by base only.

k. Remove pallet from helicopter.

l. Remove bolts, washers, and support channels from airframe.

13-6.4 REPLACE EVAPORATOR PALLET (AVIM) 13-6.4

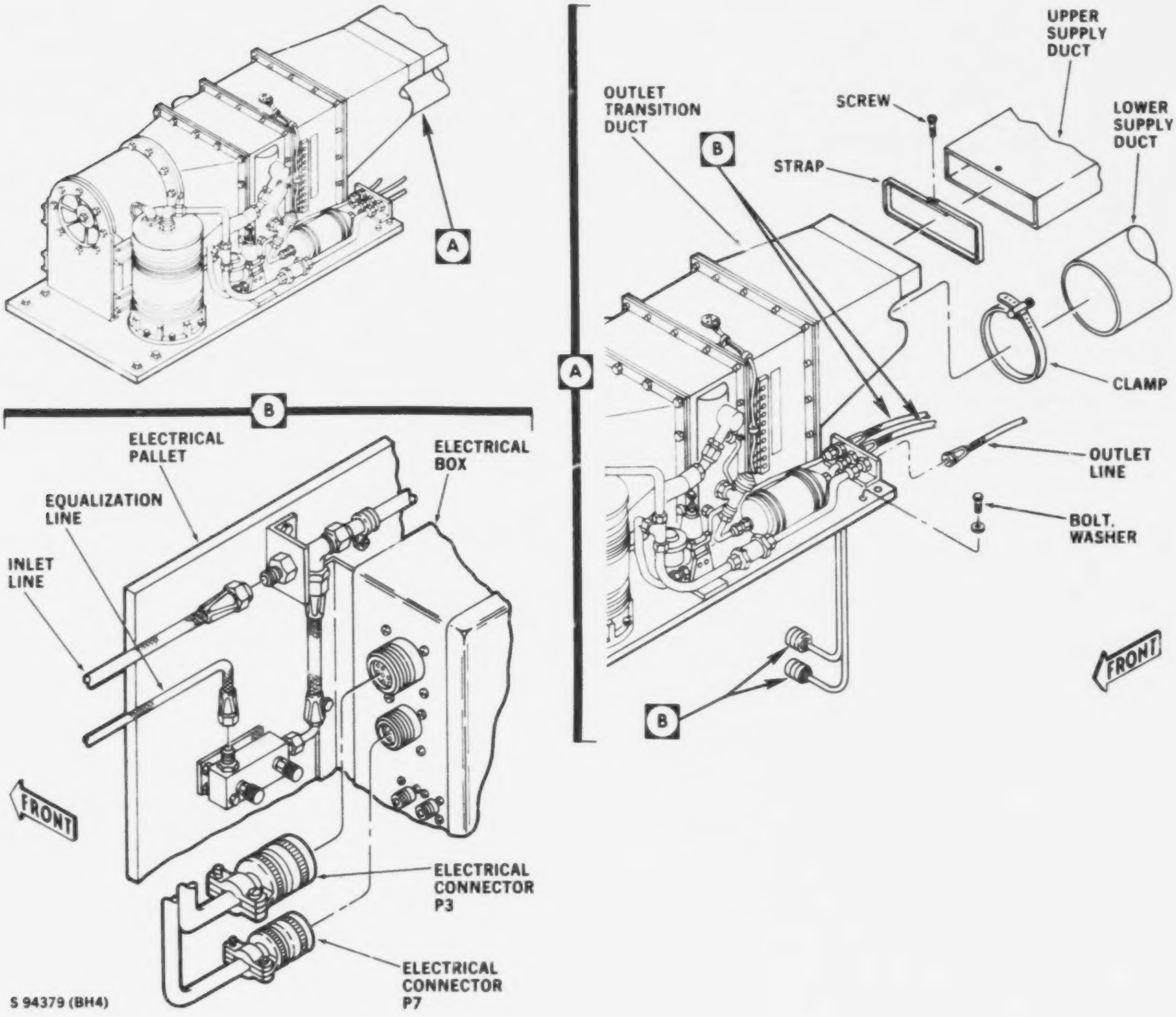

A
B
ELECTRICAL PALLET
EQUALIZATION LINE
INLET LINE
ELECTRICAL BOX
FRONT
ELECTRICAL CONNECTOR P3
ELECTRICAL CONNECTOR P7
S 94379 (BH4)
OUTLET TRANSITION DUCT
SCREW
STRAP
UPPER SUPPLY DUCT
LOWER SUPPLY DUCT
CLAMP
OUTLET LINE
BOLT, WASHER
FRONT

FIGURE 13-32

INSTALL

m. To pressure test pallet before installation do this:

WARNING

- To prevent injury to personnel, observe the following safety precautions when working on any part of the air conditioning system:
- Protect skin and eyes from possible contact with liquid refrigerant. Wear gloves and goggles. Keep your body as well protected as you can from possible contact with liquid refrigerant.
- If liquid refrigerant comes in contact with the eyes or skin, get immediate medical aid.
- The refrigerant in a sealed system is always under pressure. Do not disconnect any line or component of the pressurized cooling system without first carefully releasing the pressure.
- Freon-500 will displace air and can cause suffocation, even though it is non toxic. It will produce highly toxic phosgene gas if exposed to open flame. Make sure work area is well ventilated, and that there are no open flames, or unshielded heaters in immediate area.
- The use of heat on any part of the pressurized system will cause a pressure buildup and could cause an explosion. Do not try to solder or weld any part of the system while the system is charged with refrigerant.

(1) Connect low pressure (blue) hose to the VAC side of the servicing manifold and the high pressure (red) hose to the REF side of the servicing manifold. Make sure manifold hand wheels are closed.

(2) Uncap center fitting at rear of evaporator pallet and connect high pressure (red) hose.

(3) Connect yellow hose to Freon-500 bottle and spare vacuum gage.

NOTE

Make sure Freon-500 bottle is positioned upright so only vapors will transfer.

(4) Open valve on Freon-500 bottle and record the bottle pressure.

(5) Close valve on Freon-500 bottle and disconnect yellow hose from spare vacuum gage.

(6) Connect end of yellow hose to REF side of servicing manifold.

(7) Open Freon-500 bottle valve.

13-6.4 REPLACE EVAPORATOR PALLET (AVIM) 13-6.4

(8) Purge yellow hose of air by loosening fitting at servicing manifold until a little freon vapor comes out. Immediately tighten fitting.

(9) Open REF hand wheel until low pressure gage equals Freon-500 pressure.

(10) Close REF hand wheel and Freon-500 bottle valve. Disconnect yellow hose from freon bottle and VAC side of servicing manifold.

(11) Connect yellow hose to regulated dry nitrogen source.

(12) Slowly increase regulator pressure until it equals system pressure or slightly higher.

(13) Open REF hand wheel and slowly increase system pressure to 300 psig.

(14) Using a Halogen leak detector calibrated to detect leaks of 2 oz./year or less, check all fittings, connections, hoses, and components for leaks. Repair as necessary.

(15) Repeat until no leaks are found.

(16) Close REF hand wheel on servicing manifold.

(17) Close nitrogen valve. Disconnect yellow hose from nitrogen regulator fitting and replace hose end into a clean 5-gallon container, 1/4-full of water.

(18) Slowly open REF hand wheel and drain system until no bubbles appear in container. Pressure gages should read 0 psig.

(19) Close REF hand wheel and disconnect yellow hose.

(20) Disconnect high pressure(red) hose from rear of evaporator pallet.

(21) Immediately cap fitting.

n. Install support channels on airframe with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

CAUTION

To prevent damage to ECS, do not use lines, fittings, or other components as a handhold. Handle pallet by base only.

o. Position pallet over fuel cells and attach to support channels with bolts and washers. **TORQUE BOLTS TO 50 - 70 INCH-POUNDS.**

p. Connect outlet line to outboard fitting on pallet. Lubricate nut with compressor oil, Item 118, Appendix D. **TORQUE NUT TO 200 - 300 INCH-POUNDS.**

q. Connect inlet line and equalization line to fittings near electrical pallet. Lubricate nuts with compressor oil, Item 118, Appendix D. **TORQUE INLET LINE NUT TO 150 - 250 INCH-POUNDS. TORQUE EQUALIZATION LINE NUT TO 40 - 65 INCH-POUNDS.**

r. Connect electrical connectors P3 and P7 to left side of electrical pallet.

s. Install supply ducting on evaporator outlet duct with clamp and strap.

13-6.4 REPLACE EVAPORATOR PALLET (AVIM) 13-6.4

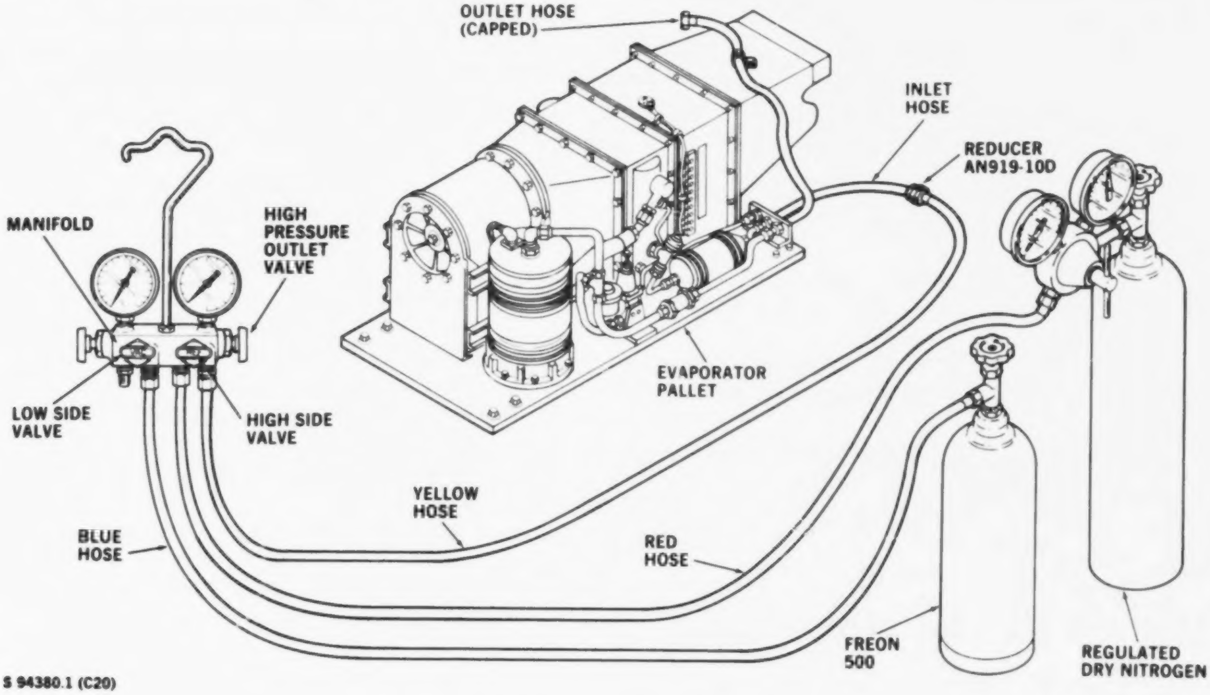
t. Install plenum (PARA 13-5).

u. Install left panel on rear cabin bulkhead (PARA 2-32).

v. Service ECS control system (PARA 1-4.1).

w. Do operational check on ECS (TM 55-1520-237-T).

x. Close avionics access door.


OUTLET HOSE (CAPPED)
INLET HOSE
REDUCER AN919-10D
MANIFOLD
HIGH PRESSURE OUTLET VALVE
EVAPORATOR PALLET
LOW SIDE VALVE
HIGH SIDE VALVE
YELLOW HOSE
BLUE HOSE
RED HOSE
FREON 500
REGULATED DRY NITROGEN

S 94380.1 (C20)

FIGURE 13-33 (SHEET 1 OF 2)

13-6.4 REPLACE EVAPORATOR PALLET (AVIM) 13-6.4

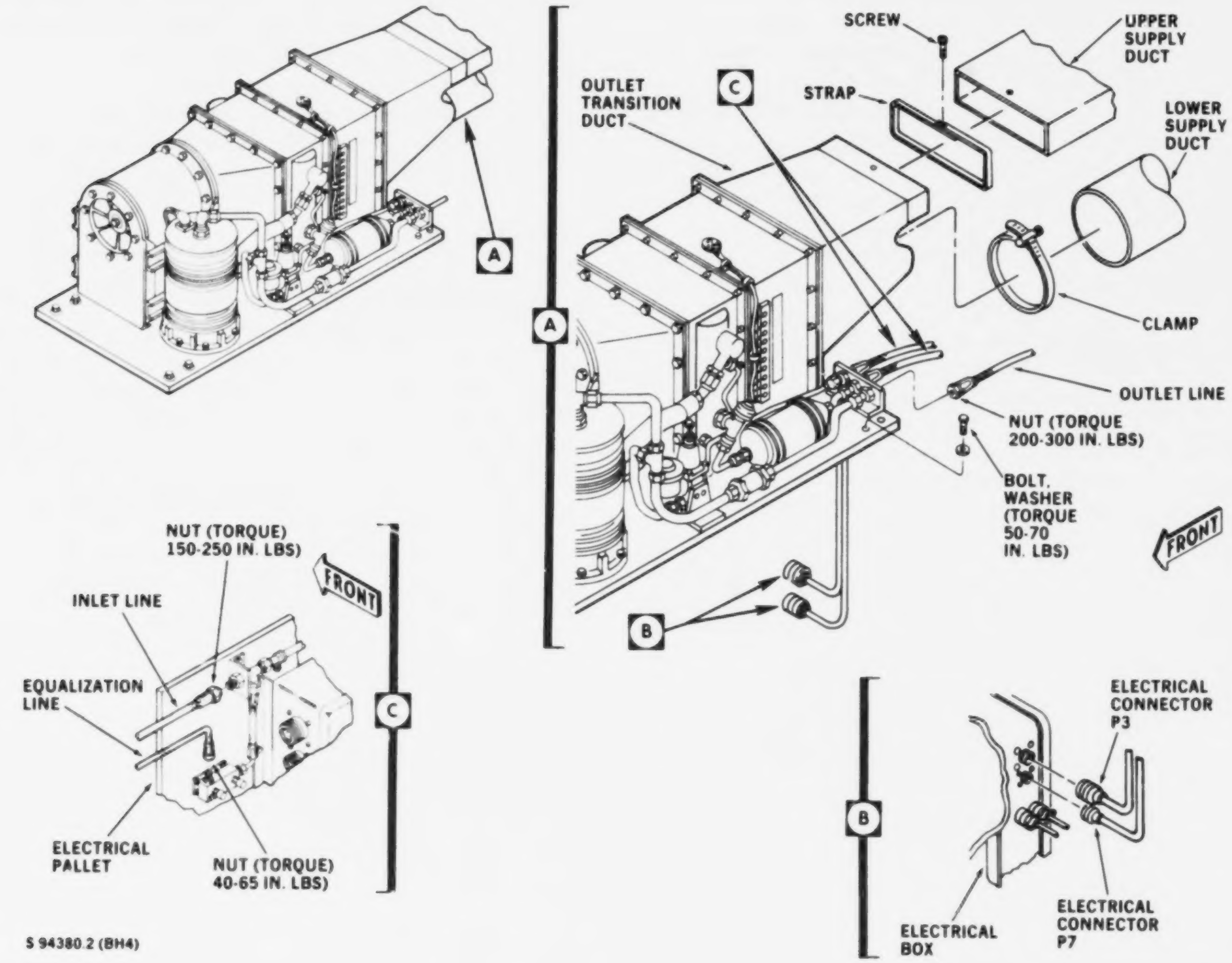

A
SCREW
UPPER SUPPLY DUCT
OUTLET TRANSITION DUCT
C
STRAP
LOWER SUPPLY DUCT
A
CLAMP
OUTLET LINE
NUT (TORQUE 200-300 IN. LBS)
BOLT, WASHER (TORQUE 50-70 IN. LBS)
FRONT
B
NUT (TORQUE) 150-250 IN. LBS)
FRONT
INLET LINE
EQUALIZATION LINE
C
ELECTRICAL PALLET
NUT (TORQUE) 40-65 IN. LBS)
ELECTRICAL CONNECTOR P3
B
ELECTRICAL BOX
ELECTRICAL CONNECTOR P7
S 94380.2 (BH4)

FIGURE 13-33 (SHEET 2 OF 2)

13-6.5 REPLACE COMPRESSOR (AVIM) 13-6.5

REMOVE

a. Turn off all electrical power.

b. Disconnect and remove electrical connector, P8, from compressor.

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

c. Loosen nuts, and remove discharge line from top of compressor and tee. Plug, NAS818-10, line and cap, NAS817-10, fitting.

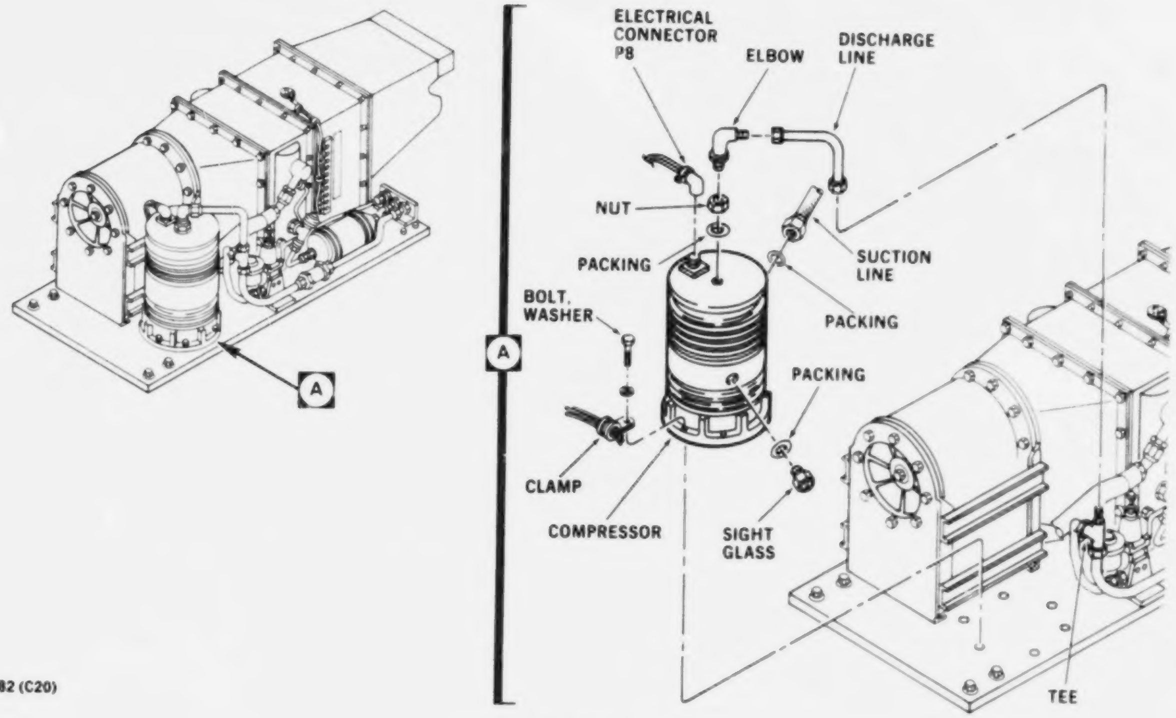
d. Loosen nut, and remove suction line from side of compressor. Plug, NAS818-12, line and cap, NAS817-12. Discard packing.

e. Remove bolts, washers, and nuts, noting location of clamp holding plenum temperature sensor wire. Remove compressor from pallet.

DISASSEMBLE

f. Loosen jamnut, and remove elbow from top of compressor. Discard packing.

g. Using a funnel and an empty container, loosen and remove sight gage from compressor, catching fluid as it exits compressor. Discard packing.


A
ELECTRICAL CONNECTOR P8
ELBOW
DISCHARGE LINE
NUT
PACKING
SUCTION LINE
BOLT, WASHER
A
PACKING
PACKING
CLAMP
COMPRESSOR
SIGHT GLASS
TEE

5 94382 (C20)

FIGURE 13-34

13-6.5 REPLACE COMPRESSOR (AVIM) 13-6.5

ASSEMBLE

h. Turn off all electrical power.

i. Install elbow on compressor with packing, NAS1595-10, lubricated with compressor oil, Item 118, Appendix D. **TORQUE ELBOW TO 200 - 300 INCH-POUNDS.**

j. Install sight gage on compressor with packing, NAS1595-08, lubricated with compressor oil, Item 118, Appendix D. **TORQUE SIGHT GLASS TO 150 - 250 INCH-POUNDS.**

INSTALL

k. Install compressor on pallet with bolts, washers, and nuts. **TORQUE NUTS TO 50 - 70 INCH-POUNDS.**

l. Uncap and install suction line on side of compressor with packing, NAS1611-115. Lubricate threads of nut with compressor oil, Item 118, Appendix D. **TORQUE NUT TO 300 - 500 INCH-POUNDS.**

m. Uncap and install discharge line between compressor elbow and tee. Lubricate threads of nuts with compressor oil, Item 118, Appendix D. **TORQUE NUTS TO 200 - 300 INCH-POUNDS.**

n. Install electrical connector, P8, on compressor.

o. Pressure test evaporator pallet (PARA 13-6.4).

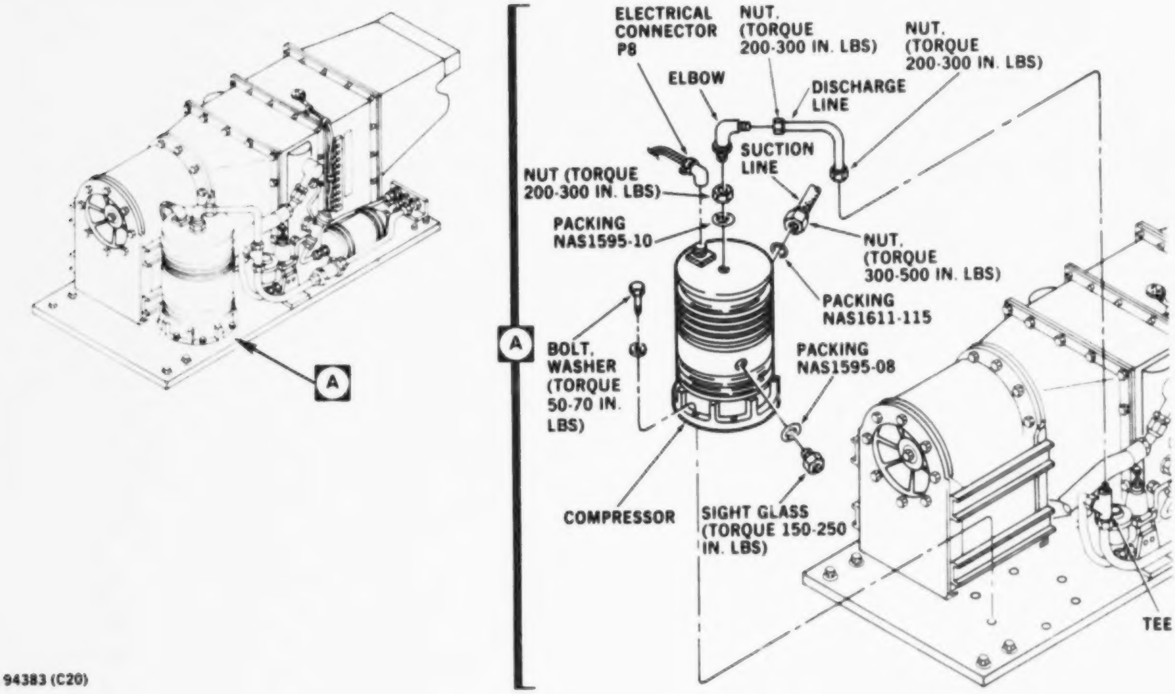

A
S 94383 (C20)
A
ELECTRICAL CONNECTOR P8
NUT. (TORQUE 200-300 IN. LBS)
NUT. (TORQUE 200-300 IN. LBS)
ELBOW
DISCHARGE LINE
SUCTION LINE
NUT (TORQUE 200-300 IN. LBS)
PACKING NAS1595-10
NUT. (TORQUE 300-500 IN. LBS)
PACKING NAS1611-115
BOLT, WASHER (TORQUE 50-70 IN. LBS)
PACKING NAS1595-08
COMPRESSOR
SIGHT GLASS (TORQUE 150-250 IN. LBS)
TEE

FIGURE 13-35

13-6.6 REPLACE HOT GAS BYPASS (HGBP) VALVE (AVIM) 13-6.6

REMOVE

REMOVE CHECK VALVE AND LINE

a. Remove bolt, washer, spacer, and clamp, holding check valve to pallet.

b. Loosen nuts at fitting bracket on rear of pallet and at compressor discharge line tee.

CAUTION

To prevent moisture from entering the air-conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

c. Remove lines, with check valve attached. Plug, NAS818-10, lines and cap, NAS817-10, fittings.

REMOVE FILTER/DRIER

d. Remove bolts, washers, and saddle clamps from filter/drier.

CAUTION

Filter/drier is extremely sensitive to moisture and humidity. Replace filter/drier if inlet and/or outlet connections are left uncapped for more than 10 minutes.

e. Loosen nuts that hold filter/drier lines on expansion valve and fitting bracket on rear of pallet.

f. Remove filter/drier from pallet. Plug, NAS818-8, lines and cap, NAS817-8, fittings.

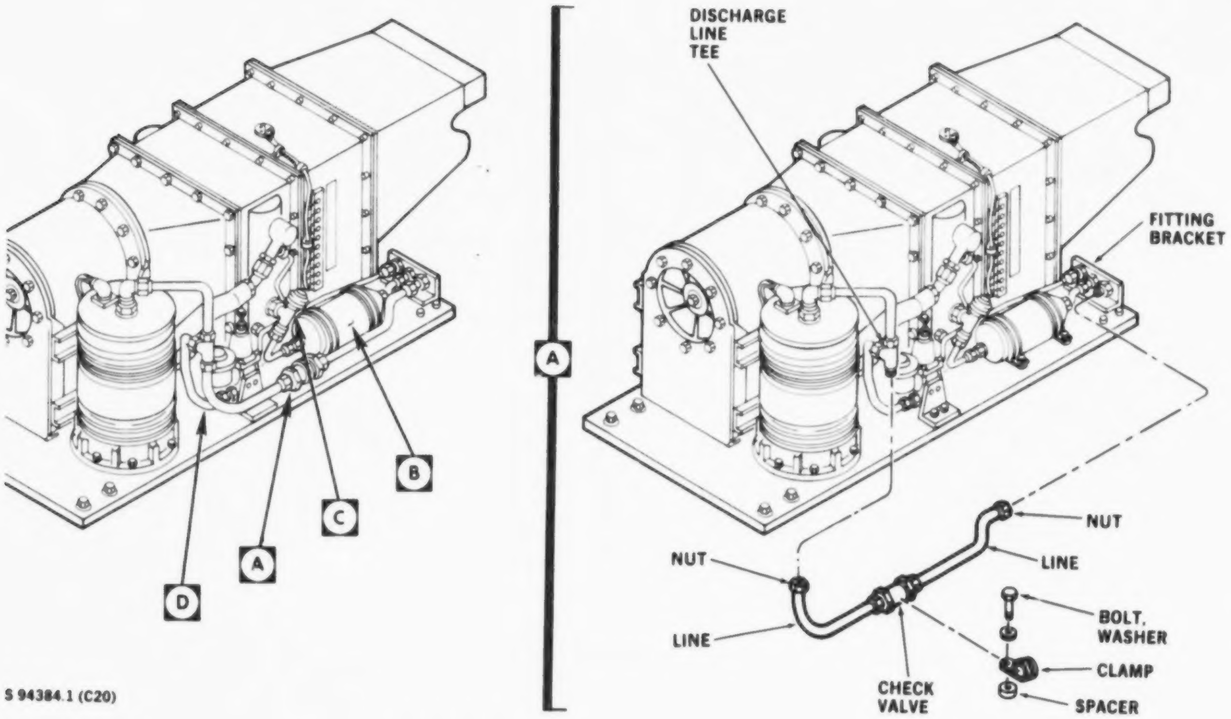

A
B
C
D
S 94384.1 (C20)
A
DISCHARGE LINE TEE
FITTING BRACKET
NUT
LINE
NUT
LINE
BOLT, WASHER
CLAMP
SPACER
CHECK VALVE

FIGURE 13-36 (SHEET 1 OF 2)

13-6.6 REPLACE HOT GAS BYPASS (HGBP) VALVE (AVIM) 13-6.6

REMOVE EQUALIZATION LINE ASSEMBLY

CAUTION

To prevent moisture from entering the air-conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

g. Loosen nuts holding equalization lines on HGBP valve, evaporator outlet fitting, and fitting bracket at rear of pallet.

h. Remove line assembly from pallet. Plug, NAS818-4, lines and cap, NAS817-4, fittings.

REMOVE HGBP VALVE

CAUTION

To prevent moisture from entering the air-conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

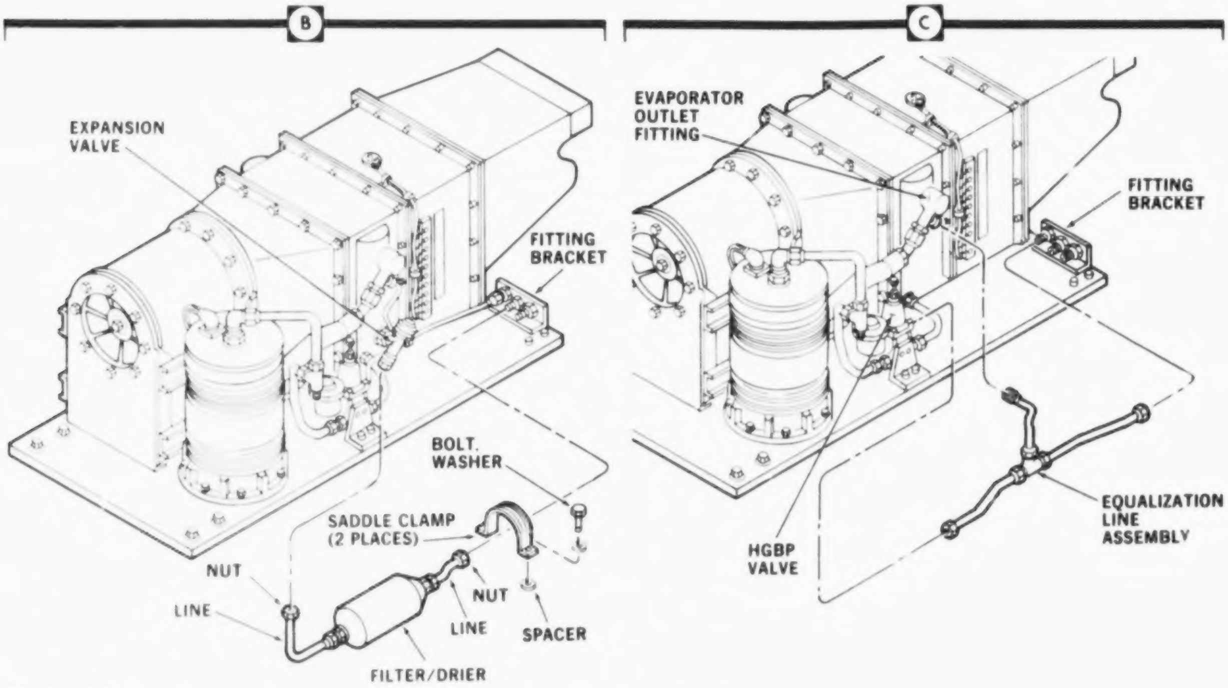
i. Loosen nuts holding line on outlet of HGBP valve and evaporator inlet. Remove and plug, NAS818-10 and NAS818-6, line. Cap, NAS817-10 and NAS817-6, fittings.

j. Remove nut holding line on inlet of HGBP valve. Plug, NAS818-10, lines and cap, NAS817-10, fittings.

k. Loosen clamps holding electrical harness to pallet. Free harness enough to remove chaff guards and spiral wrap.

l. Disconnect and free the electrical leads of HGBP valve regulator from terminals, 11 and 12, of terminal board, TB-4.

m. Unbolt and remove HGBP valve and bracket from pallet.


B
EXPANSION VALVE
FITTING BRACKET
BOLT, WASHER
SADDLE CLAMP (2 PLACES)
NUT
LINE
NUT
LINE
SPACER
FILTER/DRIER
C
EVAPORATOR OUTLET FITTING
FITTING BRACKET
EQUALIZATION LINE ASSEMBLY
HGBP VALVE

S 94384 2 (C20)

FIGURE 13-36 (SHEET 2 OF 2)

13-6.6 REPLACE HOT GAS BYPASS (HGBP) VALVE (AVIM) 13-6.6

INSTALL

INSTALL HGBP VALVE

n. Install HGBP valve on bracket with bolts and washers. **TORQUE BOLTS TO 50 - 70 INCH-POUNDS.** Lockwire, Item 199, Appendix D, boltheads.

o. Connect electrical leads of HGBP valve regulator to terminals, 11 and 12, of terminal board, TB-4.

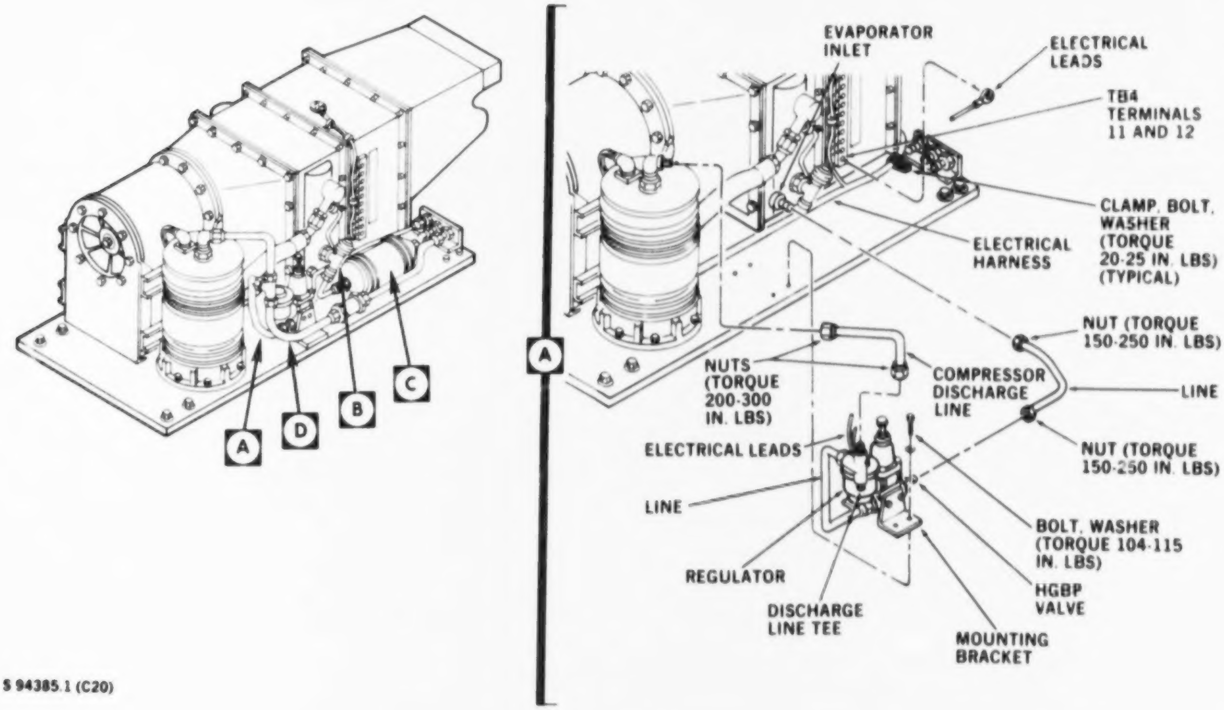
p. Install spiral wrap and chafing strip around harness. **TORQUE CLAMP BOLTS TO 20 - 25 INCH-POUNDS.**

q. Install line between compressor discharge line tee and HGBP valve inlet. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUTS TO 200 - 300 INCH-POUNDS.**

r. Install line between evaporator inlet and HGBP valve outlet. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUTS TO 150 - 250 INCH-POUNDS.**

INSTALL EQUALIZATION LINE ASSEMBLY

s. Install equalization line on HGBP valve, evaporator outlet fitting and fitting bracket at rear of pallet. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE ALL NUTS TO 40 - 65 INCH-POUNDS.**


A
D
B
C
A
EVAPORATOR INLET
ELECTRICAL LEADS
TB4 TERMINALS 11 AND 12
CLAMP, BOLT, WASHER (TORQUE 20-25 IN. LBS) (TYPICAL)
ELECTRICAL HARNESS
NUT (TORQUE 150-250 IN. LBS)
NUTS (TORQUE 200-300 IN. LBS)
COMPRESSOR DISCHARGE LINE
LINE
NUT (TORQUE 150-250 IN. LBS)
ELECTRICAL LEADS
LINE
BOLT, WASHER (TORQUE 104-115 IN. LBS)
REGULATOR
HGBP VALVE
DISCHARGE LINE TEE
MOUNTING BRACKET

S 94385.1 (C20)

FIGURE 13-37 (SHEET 1 OF 3)

INSTALL FILTER/DRIER

CAUTION

Filter/drier is extremely sensitive to moisture and humidity. Replace filter/drier if inlet and outlet connections are left uncapped for more than 10 minutes.

t. Install filter/drier on pallet with bolts, washers, spacers, and saddle clamps. **TORQUE BOLTS TO 20 -25 INCH-POUNDS.**

u. Remove caps and plugs. Install lines on expansion valve and fitting bracket at rear of pallet. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUT ON EXPANSION VALVE TO 75 - 125 INCH POUNDS. TORQUE NUT ON FITTING BRACKET TO 150 - 250 INCH-POUNDS.**

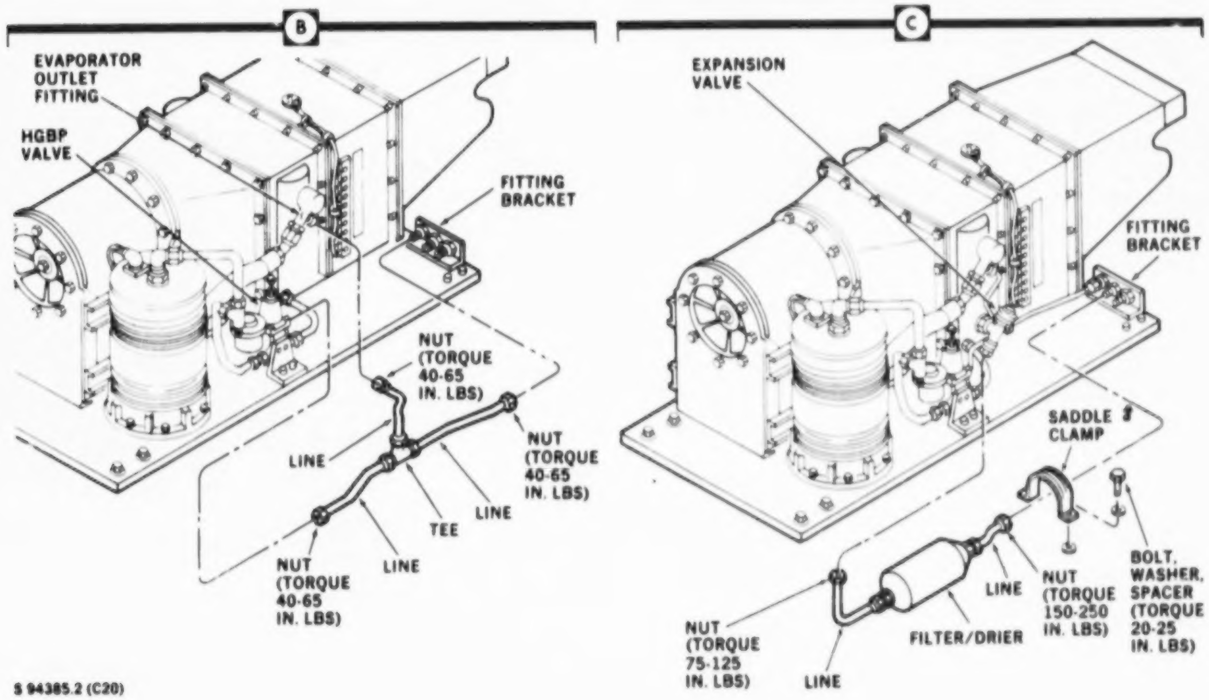

B
EVAPORATOR OUTLET FITTING
HGBP VALVE
FITTING BRACKET
NUT (TORQUE 40-65 IN. LBS)
NUT (TORQUE 40-65 IN. LBS)
LINE
LINE
TEE
NUT (TORQUE 40-65 IN. LBS)
LINE
S 94385.2 (C20)
C
EXPANSION VALVE
FITTING BRACKET
SADDLE CLAMP
BOLT, WASHER, SPACER (TORQUE 20-25 IN. LBS)
NUT (TORQUE 150-250 IN. LBS)
LINE
FILTER/DRIER
NUT (TORQUE 75-125 IN. LBS)
LINE

FIGURE 13-37 (SHEET 2 OF 3)

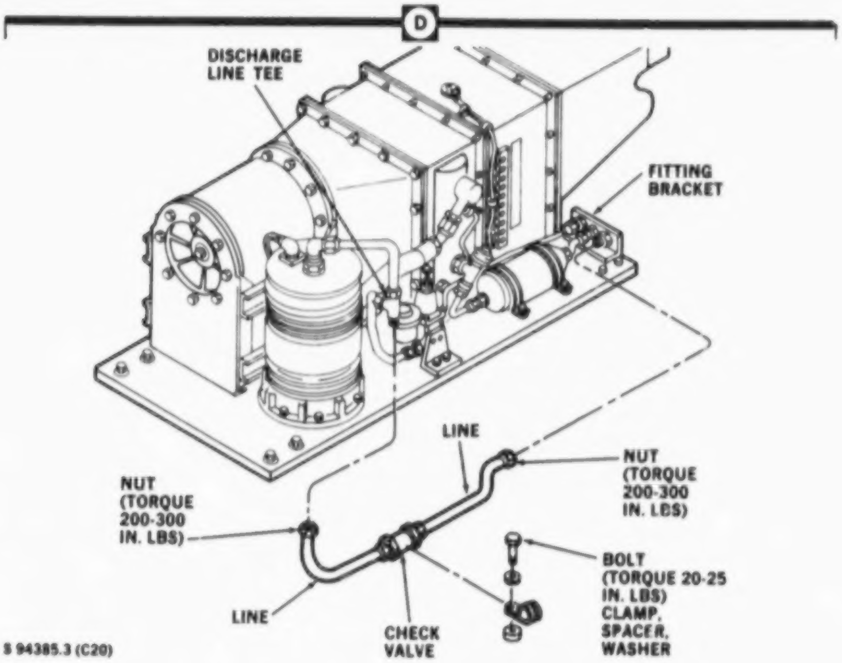
13-6.6 REPLACE HOT GAS BYPASS (HGBP) VALVE (AVIM) 13-6.6

INSTALL CHECK VALVE AND LINE

v. Position check valve line assembly on pallet. Install on fitting bracket at rear of pallet and compressor discharge line tee. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUTS TO 200 - 300 INCH-POUNDS.**

w. Install bolt, washer, spacers, and clamp on check valve. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

x. Pressure test evaporator pallet (PARA 13-6.4).


D
DISCHARGE LINE TEE
FITTING BRACKET
LINE
NUT (TORQUE 200-300 IN. LBS)
NUT (TORQUE 200-300 IN. LBS)
BOLT (TORQUE 20-25 IN. LBS) CLAMP, SPACER, WASHER
LINE
CHECK VALVE

S 94385.3 (C20)

FIGURE 13-37 (SHEET 3 OF 3)

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

REMOVE

NOTE

The inlet transition duct, evaporator heat exchanger, and the heater/demister are removed as an assembly from the pallet and disassembled thereafter.

a. Remove bolts and washers holding evaporator outlet transition duct to heater/demister.

b. Remove evaporator blower (PARA 13-5).

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all fittings and plug all lines immediately after disconnecting them.

c. Loosen nut holding compressor suction line to evaporator outlet. Plug, NAS818-12, line and cap, NAS817-12, fitting.

d. Remove hot gas bypass valve (PARA 13-6.6).

e. Remove thermistor from evaporator heat exchanger outlet. Plug, NAS818-4, fitting.

f. Disconnect and tag wire from expansion valve.

g. Slit foam from around low temperature switch. Remove and tag switch.

h. Slit foam from around high temperature switch. Remove and tag switch.

i. Slit foam from around limiting switch. Remove and tag switch.

j. Disconnect and tag all electrical connectors on heater/demister terminal board, TB-4.

k. Disconnect and tag heater element leads on heater demister.

l. Remove electrical harness from clips.

m. Disconnect demister drain tube.

n. Remove bolts, washers, and nuts holding assembly to pallet.

o. Remove sealing compound from evaporator heat exchanger, heater/demister and pallet with a nonmetallic scraper.

DISASSEMBLE

p. Remove bolts and washers holding heater/demister to evaporator.

q. To disassemble heater/demister, do this:

NOTE

Each heat element is different. Do not attempt to interchange them.

(1) Remove nuts, washers, lockwashers, and fiber washers (inside housing) holding heater elements to housing. Remove heater elements. Discard nuts.

(2) Slit foam from around heater/demister and remove screws and nuts holding retaining brackets to heater/demister housing.

(3) Remove demister pad and screen.

r. Remove bolts and washers holding evaporator to inlet transition duct.

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

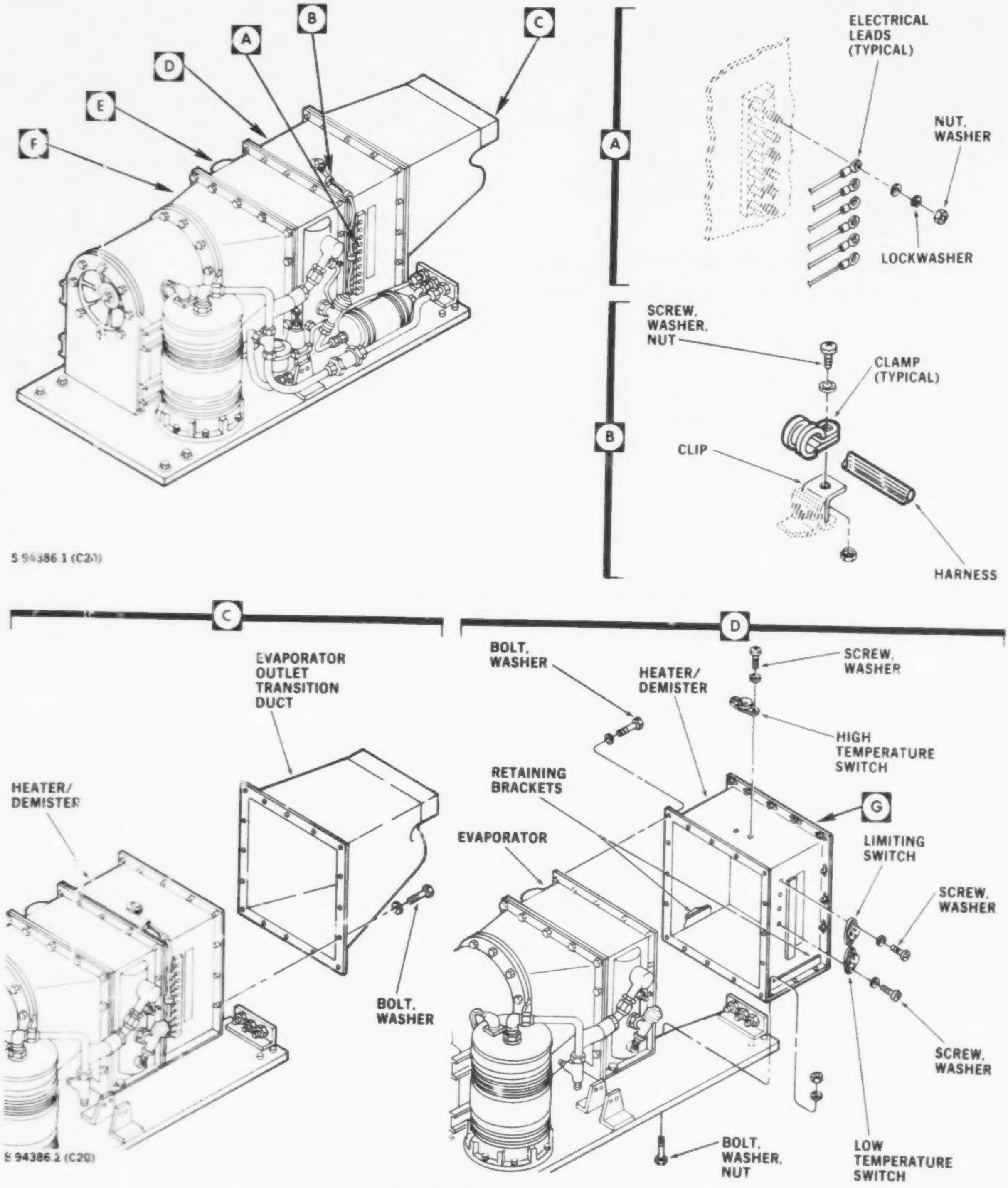

A
B
C
D
E
F
S 94386.1 (C20)
A
ELECTRICAL LEADS (TYPICAL)
NUT, WASHER
LOCKWASHER
B
SCREW, WASHER, NUT
CLAMP (TYPICAL)
CLIP
HARNESS
C
EVAPORATOR OUTLET TRANSITION DUCT
HEATER/ DEMISTER
BOLT, WASHER
S 94386.2 (C20)
D
BOLT, WASHER
HEATER/ DEMISTER
SCREW, WASHER
HIGH TEMPERATURE SWITCH
RETAINING BRACKETS
EVAPORATOR
G
LIMITING SWITCH
SCREW, WASHER
SCREW, WASHER
BOLT, WASHER, NUT
LOW TEMPERATURE SWITCH

FIGURE 13-38 (SHEET 1 OF 3)

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

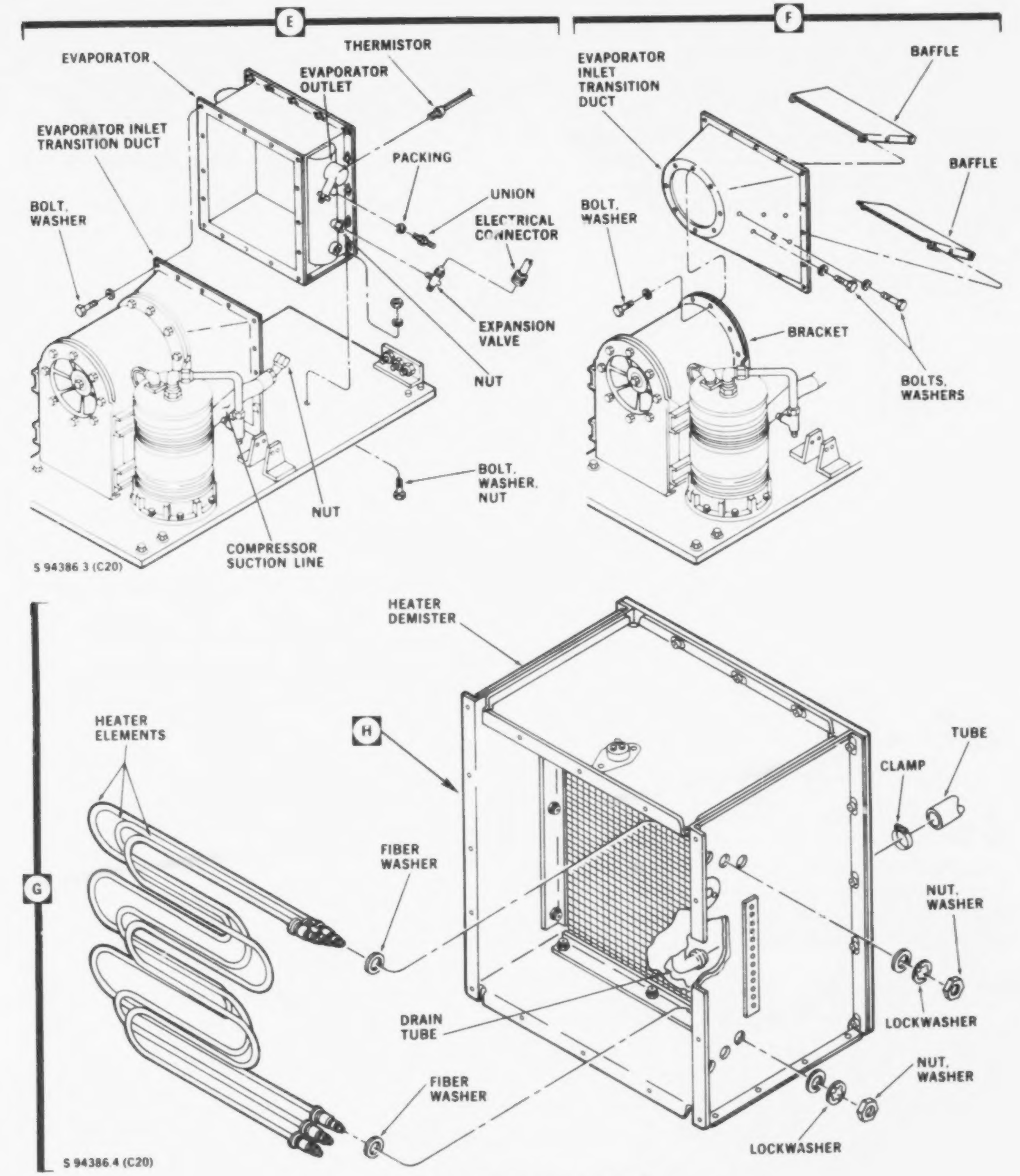

E
EVAPORATOR
THERMISTOR
EVAPORATOR OUTLET
EVAPORATOR INLET TRANSITION DUCT
PACKING
UNION
ELECTRICAL CONNECTOR
BOLT, WASHER
EXPANSION VALVE
NUT
BOLT, WASHER, NUT
NUT
COMPRESSOR SUCTION LINE
S 94386 3 (C20)
F
EVAPORATOR INLET TRANSITION DUCT
BAFFLE
BAFFLE
BOLT, WASHER
BRACKET
BOLTS, WASHERS
HEATER DEMISTER
HEATER ELEMENTS
H
TUBE
CLAMP
FIBER WASHER
G
NUT, WASHER
LOCKWASHER
DRAIN TUBE
NUT, WASHER
FIBER WASHER
LOCKWASHER
S 94386.4 (C20)

FIGURE 13-38 (SHEET 2 OF 3)

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

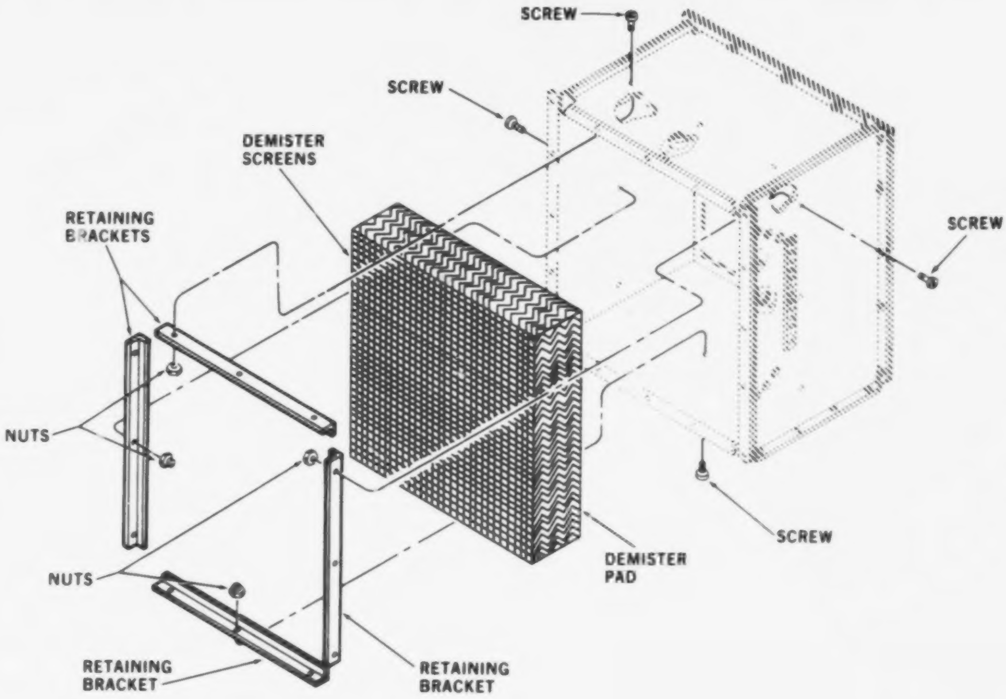

SCREW
SCREW
DEMISTER SCREENS
RETAINING BRACKETS
SCREW
NUTS
NUTS
SCREW
DEMISTER PAD
RETAINING BRACKET
RETAINING BRACKET
S 94386.5 (C20)

FIGURE 13-38 (SHEET 3 OF 3)

s. To disassemble evaporator heat exchanger, do this:

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

(1) Remove union from outlet fitting. Plug, NAS818-4, fitting. Discard packing.

CAUTION

To avoid cracking fitting, be careful when loosening nut holding expansion valve to evaporator inlet.

(2) Loosen nut holding expansion valve to evaporator. Plug, NAS818-8, fitting and cap, NAS817-8, expansion valve.

t. To disassemble inlet transition duct unbolt and remove guide vanes from duct.

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

ASSEMBLE

u. Assemble inlet transition duct, by installing guide vanes in duct with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

v. To assemble evaporator, do this:

(1) Remove cap and plug from expansion valve and fitting.

CAUTION

To avoid cracking fitting, be careful when tightening nut holding expansion valve to evaporator inlet.

(2) Connect expansion valve to evaporator fitting. Lubricate nut with compressor oil, Item 118, Appendix D. **TORQUE NUT TO 150 - 250 INCH-POUNDS.**

(3) Remove plug and connect union to evaporator outlet fitting using packing, NAS1595-04. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE UNION TO 40 - 65 INCH-POUNDS.**

w. Install evaporator on inlet transition duct with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

x. To assemble heater/demister, do this:

(1) Position demister pad and screen in housing. Install with retaining brackets, screws, and nuts. **TORQUE NUTS TO 12 - 15 INCH-POUNDS.**

NOTE

Each heater element is different. Do not attempt to interchange them.

(2) Install heater elements in housing with new nuts, washers, lockwashers, and fiber washers (inside housing). **TORQUE NUTS TO 20 - 25 INCH-POUNDS.**

y. Install heater/demister on evaporator with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

INSTALL

z. Seal evaporator and heater/demister to pallet with sealing compound, Item 312, Appendix D. Install bolts, washers and nuts. **TORQUE NUTS TO 50 - 70 INCH-POUNDS.**

aa. Connect heater/demister drain tube.

ab. Remove plug and cap. Connect compressor suction line to evaporator outlet. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUTS TO 300 - 500 INCH-POUNDS.**

ac. Install inlet transition duct on to blower housing with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

ad. Connect electrical harness to clips with clamps, screws, washers, and nuts. **TORQUE NUTS TO 20 -25 INCH-POUNDS.**

ae. Install limiting switch on housing with screws and washers. **TORQUE SCREWS TO 12 - 15 INCH-POUNDS.**

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

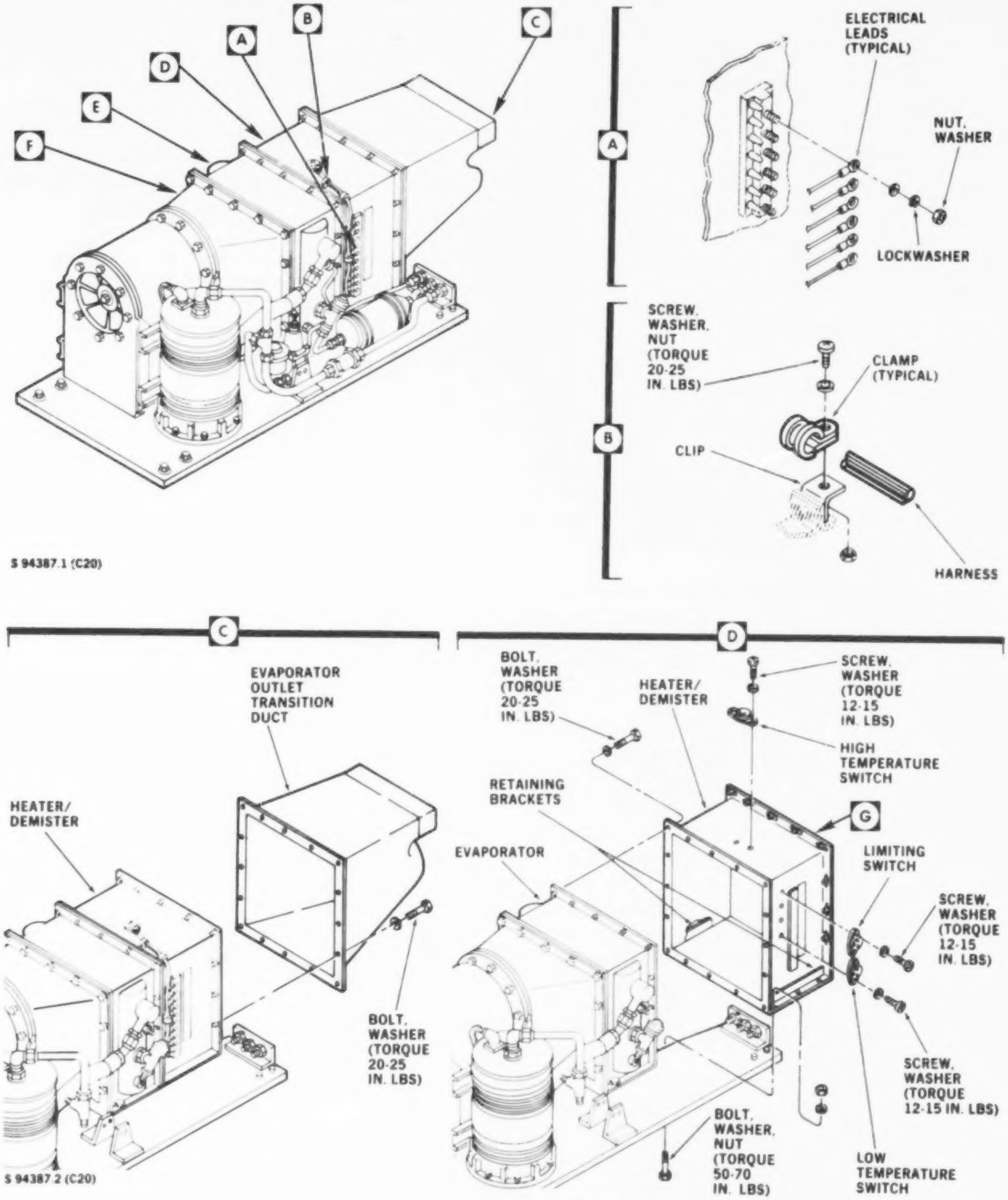
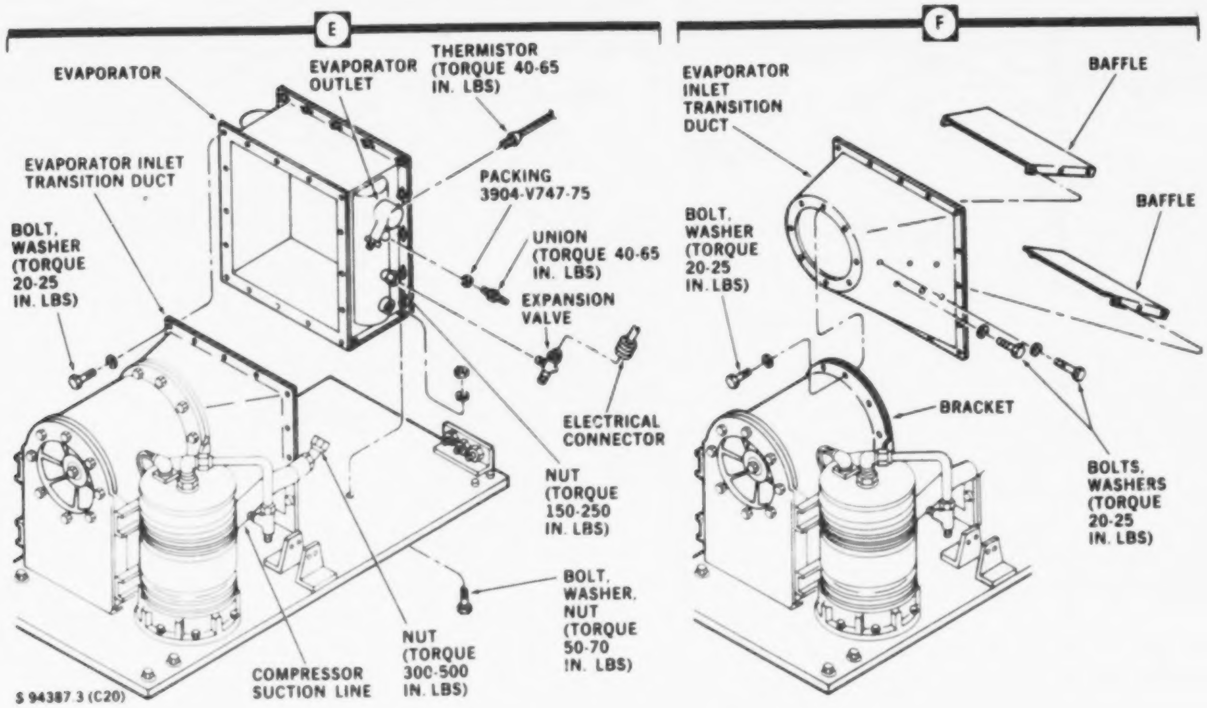

A
B
C
D
E
F
S 94387.1 (C20)
A
ELECTRICAL LEADS (TYPICAL)
NUT, WASHER
LOCKWASHER
B
SCREW, WASHER, NUT (TORQUE 20-25 IN. LBS)
CLAMP (TYPICAL)
CLIP
HARNESS
C
EVAPORATOR OUTLET TRANSITION DUCT
HEATER/ DEMISTER
BOLT, WASHER (TORQUE 20-25 IN. LBS)
S 94387.2 (C20)
D
BOLT, WASHER (TORQUE 20-25 IN. LBS)
HEATER/ DEMISTER
SCREW, WASHER (TORQUE 12-15 IN. LBS)
HIGH TEMPERATURE SWITCH
RETAINING BRACKETS
G
EVAPORATOR
LIMITING SWITCH
SCREW, WASHER (TORQUE 12-15 IN. LBS)
SCREW, WASHER (TORQUE 12-15 IN. LBS)
BOLT, WASHER, NUT (TORQUE 50-70 IN. LBS)
LOW TEMPERATURE SWITCH

FIGURE 13-39 (SHEET 1 OF 3)

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7


E
EVAPORATOR
EVAPORATOR OUTLET
THERMISTOR (TORQUE 40-65 IN. LBS)
EVAPORATOR INLET TRANSITION DUCT
PACKING 3904-V747-75
BOLT, WASHER (TORQUE 20-25 IN. LBS)
UNION (TORQUE 40-65 IN. LBS)
EXPANSION VALVE
ELECTRICAL CONNECTOR
NUT (TORQUE 150-250 IN. LBS)
BOLT, WASHER, NUT (TORQUE 50-70 IN. LBS)
NUT (TORQUE 300-500 IN. LBS)
COMPRESSOR SUCTION LINE
S 94387.3 (C20)
F
EVAPORATOR INLET TRANSITION DUCT
BAFFLE
BAFFLE
BOLT, WASHER (TORQUE 20-25 IN. LBS)
BRACKET
BOLTS, WASHERS (TORQUE 20-25 IN. LBS)

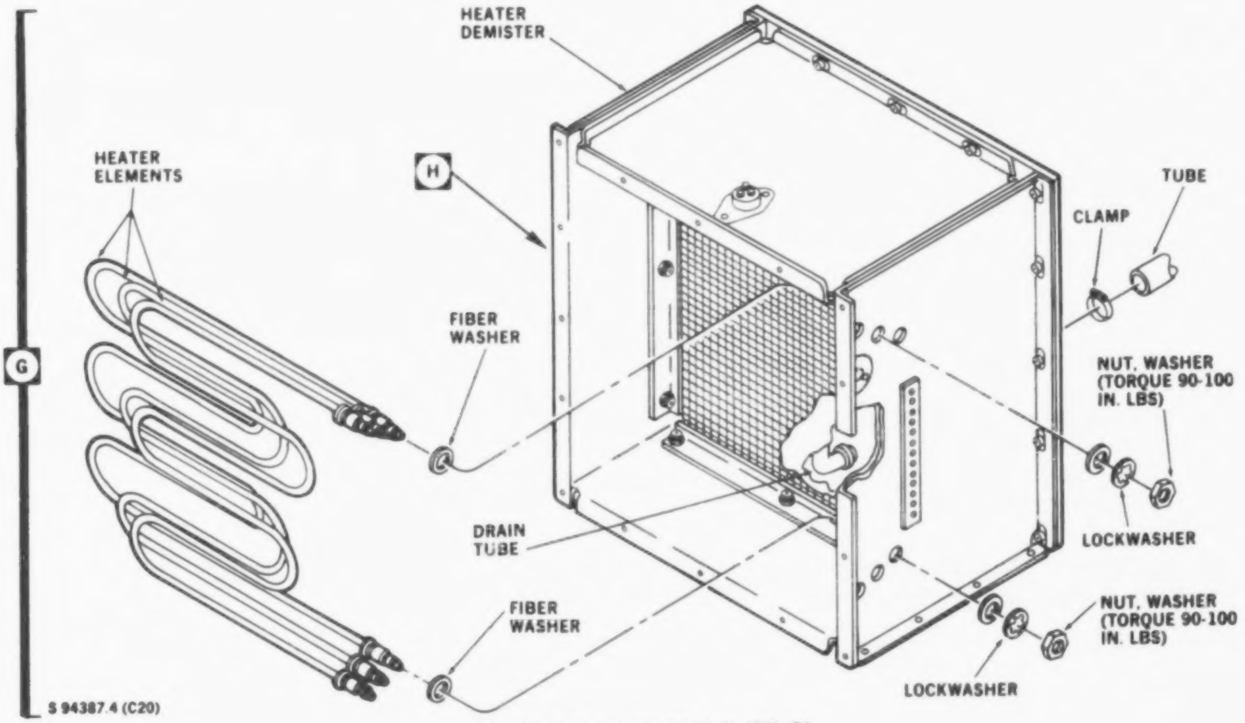

HEATER DEMISTER
H
HEATER ELEMENTS
G
TUBE
CLAMP
FIBER WASHER
NUT, WASHER (TORQUE 90-100 IN. LBS)
DRAIN TUBE
LOCKWASHER
FIBER WASHER
NUT, WASHER (TORQUE 90-100 IN. LBS)
LOCKWASHER
S 94387.4 (C20)

FIGURE 13-39 (SHEET 2 OF 3)

13-6.7 REPLACE DUCTS, HEAT EXCHANGER, HEATER/DEMISTER (AVIM) 13-6.7

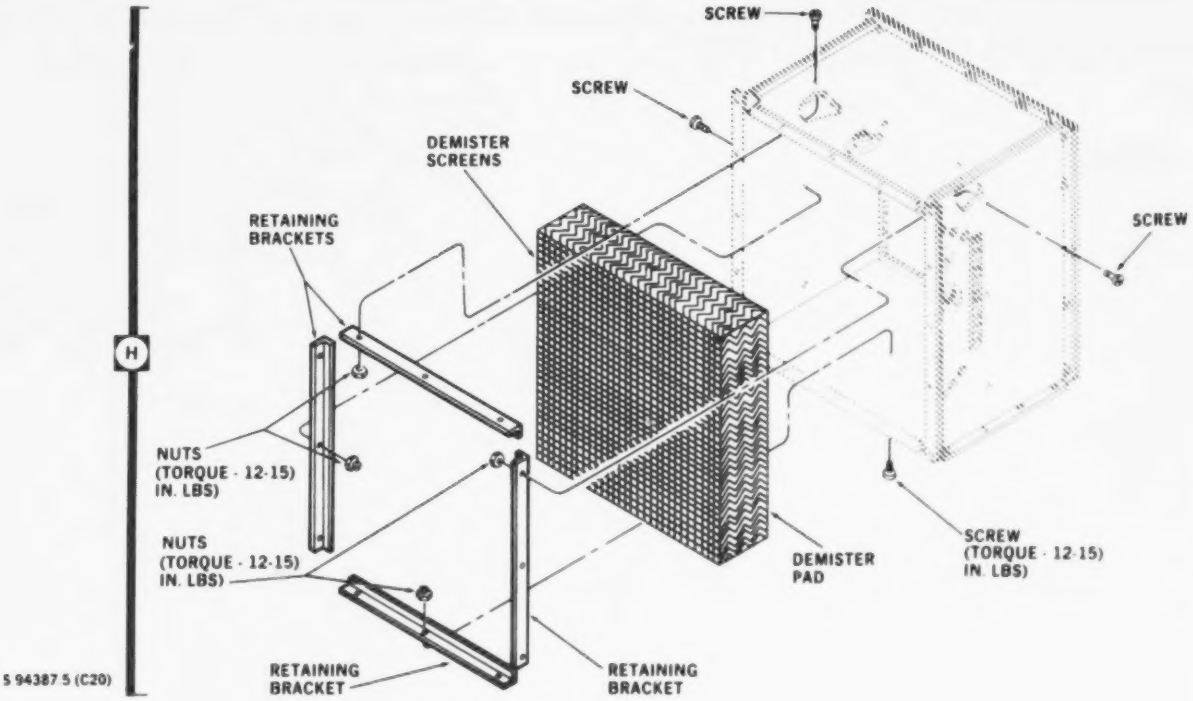

SCREW
SCREW
DEMISTER SCREENS
RETAINING BRACKETS
SCREW
H
NUTS (TORQUE - 12-15) IN. LBS)
NUTS (TORQUE - 12-15) IN. LBS)
DEMISTER PAD
SCREW (TORQUE - 12-15) IN. LBS)
RETAINING BRACKET
RETAINING BRACKET
5 94387 5 (C20)

FIGURE 13-39 (SHEET 3 OF 3)

af. Install high temperature switch on housing with screws and washers. **TORQUE SCREWS TO 12 - 15 INCH-POUNDS.**

ag. Install low temperature switch on housing with screws and washers. **TORQUE SCREWS TO 12 - 15 INCH-POUNDS.**

ah. Repair foam insulation with sealant, Item 303, Appendix D. Replace if required.

ai. Remove plug and install thermistor into evaporator heat exchanger outlet fitting. Coat threads with Loctite, Item 396, Appendix D. Tighten as necessary.

aj. Connect all electrical connectors to terminal board, TB-4, on heater/demister.

ak. Connect heater element leads to heater/demister.

al. Install expansion valve electrical connector.

am. Install hot gas bypass valve (PARA 13-6.6).

an. Install evaporator blower (PARA 13-5).

ao. Install evaporator outlet transition duct on heater/ demister with bolts and washers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

ap. Pressure test evaporator pallet (PARA 13-6.4).

13-6.8 REPLACE ELECTRICAL PALLET (AVIM) 13-6.8

REMOVE

a. Deservice ECS (PARA 1-4.1).

b. Remove all electrical power from helicopter.

c. Disconnect all electrical connectors, P3, P4, P7, P456, and P457, from electrical box assembly.

d. Remove bolt, washer, spacer, and clamp holding inlet hose to pallet.

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to plug all lines and cap all fittings after disconnecting them.

e. Disconnect hoses at inlet and outlet side of sight glass assembly. Plug, NAS818-8, hoses and cap, NAS817-8, fittings.

f. Disconnect hose at servicing manifold. Plug, NAS818-4, hose and cap, NAS817-4, fitting.

g. Remove bolts and washers holding pallet to airframe.

CAUTION

To prevent damage to ECS, do not use lines, fittings, and other components as a handhold. Handle pallet by base only.

h. Remove pallet from helicopter.

INSTALL

i. Position electrical pallet in helicopter and attach with bolts and washers. **TORQUE BOLTS TO 50 - 70 INCH-POUNDS.**

j. Remove plug and cap and connect hose to servicing manifold. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUT TO 40 - 65 INCH-POUNDS.**

k. Remove plugs and caps and connect hoses to sight glass assembly. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUT TO 150 - 250 INCH-POUNDS.**

l. Attach inlet hose to pallet with bolts, washer, spacer, and clamp. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

m. Install electrical connectors, P3, P4, P7, P456, and P457, to electrical box assembly.

n. Service ECS (PARA 1-4.1).

o. Do an operational check of ECS (TM 55-1520-237-T).

13-6.8 REPLACE ELECTRICAL PALLET (AVIM) 13-6.8

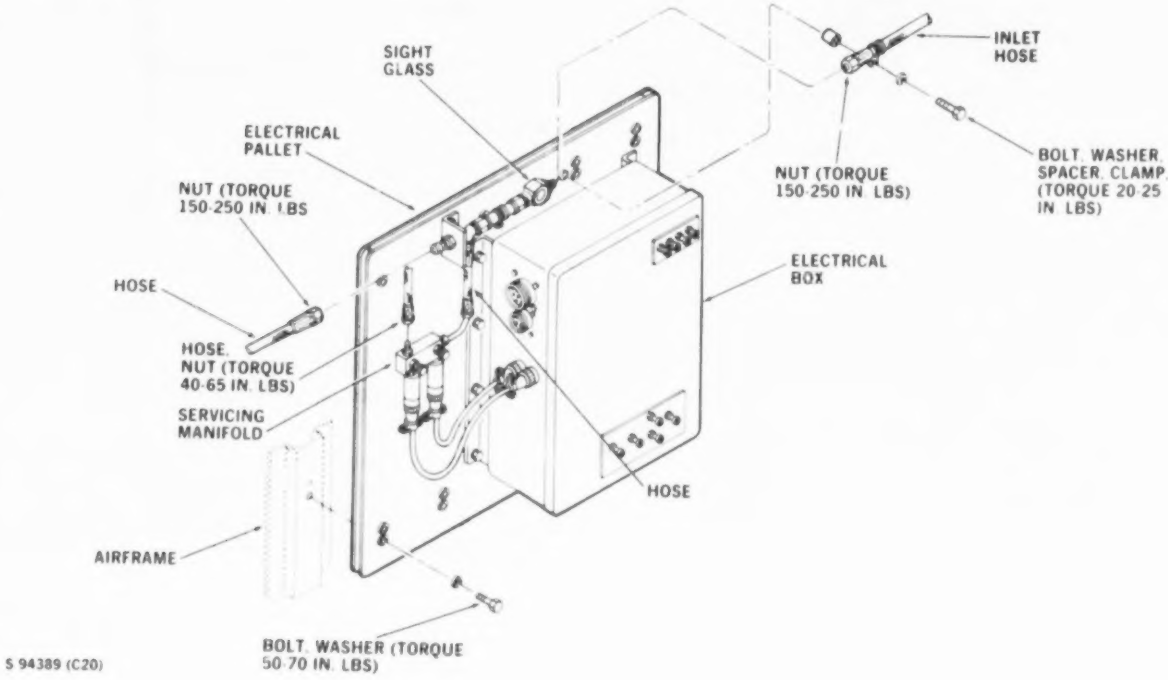

SIGHT GLASS
INLET HOSE
ELECTRICAL PALLET
NUT (TORQUE 150-250 IN. LBS
NUT (TORQUE 150-250 IN. LBS)
BOLT, WASHER, SPACER, CLAMP, (TORQUE 20-25 IN. LBS)
ELECTRICAL BOX
HOSE
HOSE, NUT (TORQUE 40-65 IN. LBS)
SERVICING MANIFOLD
HOSE
AIRFRAME
BOLT, WASHER (TORQUE 50-70 IN. LBS)
S 94389 (C20)

FIGURE 13-40

13-6.9 REPLACE SERVICING MANIFOLD (AVIM) 13-6.9

REMOVE

a. Deservice ECS (PARA 1-4.1)

b. Disconnect high and low pressure switches from servicing manifold.

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

c. Remove hose assemblies from servicing manifold. Plug, NAS818-4, hoses and cap, NAS817-4, fittings.

d. Remove bolts, washers and spacers holding manifold to pallet.

e. Remove manifold from pallet.

INSTALL

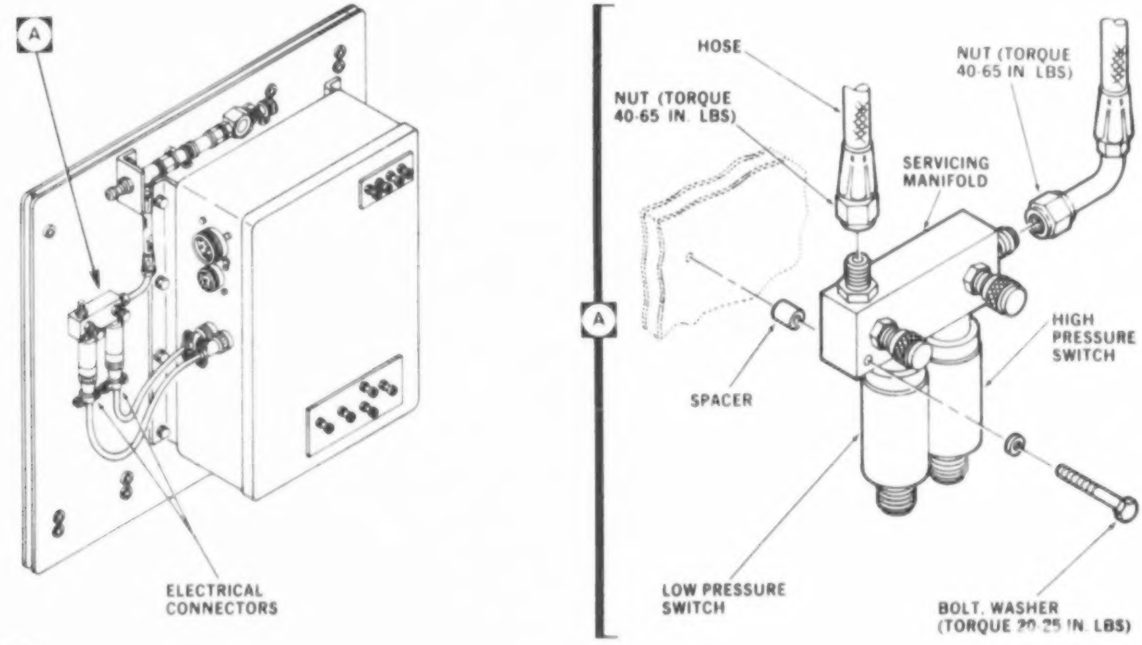
f. Position manifold on pallet and attach with bolts, washers and spacers. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

g. Remove caps and plugs and install hose assemblies on manifold fittings. Lubricate threads with compressor oil, Item 118, Appendix D. **TORQUE NUTS TO 40 -65 INCH-POUNDS.**

h. Install pressure switches on manifold.

i. Service ECS (PARA 1-4.1).

j. Do an operational check of ECS (TM 55-1520-237-T).


A
ELECTRICAL CONNECTORS
A
HOSE
NUT (TORQUE 40-65 IN. LBS)
NUT (TORQUE 40-65 IN. LBS)
SERVICING MANIFOLD
HIGH PRESSURE SWITCH
SPACER
LOW PRESSURE SWITCH
BOLT, WASHER (TORQUE 20-25 IN. LBS)

S 94390 (C20)

FIGURE 13-41

13-6.10 REPLACE SIGHT GLASS (AVIM) 13-6.10

REMOVE

a. Deservice ECS (PARA 1-4.1).

CAUTION

To prevent moisture from entering the air conditioning system and damaging parts, be sure to cap all lines immediately after disconnecting them.

b. Disconnect hose from ends of sight glass. Plug, NAS818-8, hoses and cap, NAS817-8, fittings.

c. Remove bolt, washer, and spacer from clamp and slide hose back.

d. Remove sight glass.

INSTALL

e. Position sight glass between ends of hoses.

f. Remove plugs from hoses and caps from fittings. Lubricate threads with compressor oil, Item 118, Appendix D, and loosely connect hoses to sight glass.

g. Install bolt, washer, and spacer in clamp. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

h. **TORQUE NUTS ON HOSES TO 150 - 250 INCH-POUNDS.**

i. Service ECS (PARA 1-4.1).

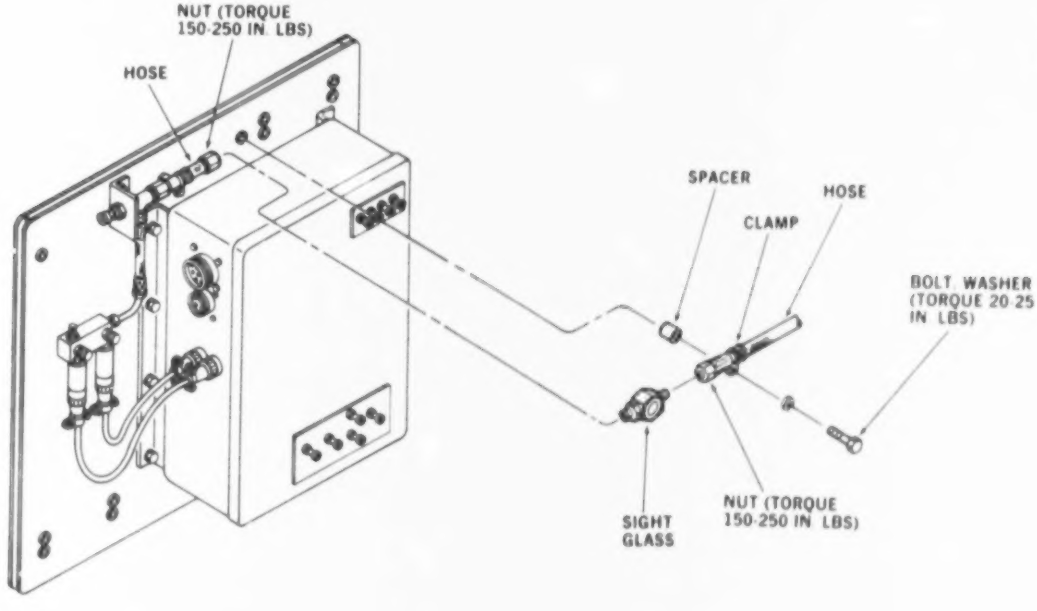

NUT (TORQUE 150-250 IN. LBS)
HOSE
SPACER
HOSE
CLAMP
BOLT WASHER (TORQUE 20-25 IN. LBS)
SIGHT GLASS
NUT (TORQUE 150-250 IN. LBS)
S 94391 (C20)

FIGURE 13-42

13-7 ENVIRONMENTAL CONTROL ELECTRICAL SYSTEM 13-7

PARAGRAPH BREAKDOWN

13-7.1	REPLACE ELECTRICAL CONTROL UNIT
13-7.2	REPLACE TEMPERATURE SENSOR
13-7.3	REPLACE TEMPERATURE LIMITING SWITCH
13-7.4	REPLACE LOW AND HIGH TEMPERATURE SWITCHES

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68F - Aircraft Electrical Repairer

MATERIALS/PARTS

- Sealant, Item 304, Appendix D
- Tags
- Tiedown Straps, Item 360, Appendix D

TOOLS

- Aircraft Electrical Repairer's Toolkit, SC 5180-99-CL-A06
- Torque Wrench 0 - 30 in. lbs., GGG-W-00686

REFERENCES

- TM 55-1520-237-T

13-7.1 REPLACE ELECTRICAL CONTROL UNIT 13-7.1

REMOVE

a. Turn off all electrical power.

b. Disconnect all electrical connectors from electrical control unit.

CAUTION

To prevent damage to ECS do not use lines, fittings, or assemblies as a hand hold.

c. Support electrical control unit and remove nuts and washers.

d. Remove electrical control unit from pallet.

INSTALL

e. Turn off all electrical power.

f. Position electrical control unit on electrical pallet assembly and secure with nuts and washers.

g. Connect electrical connectors to electrical control unit as follows:

P456 to J1, P457 to J2, P3 to J3, P4 to J4, P5 to J5, P6 to J6, and P7 to J7.

h. Be sure area is clear and free of foreign objects.

i. Do an operational check of ECS (TM 55-1520-237-T).

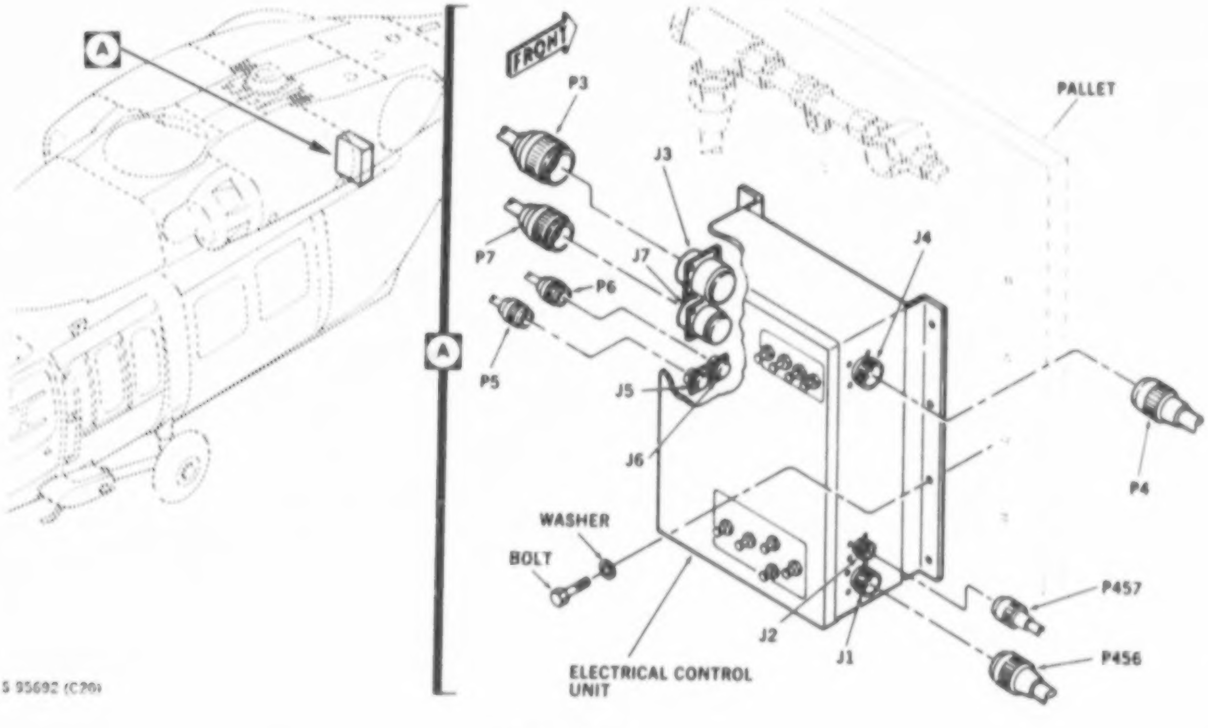

A
FRONT
P3
J3
PALLET
P7
J7
P6
J4
A
P5
J5
J6
P4
WASHER
BOLT
P457
J2
J1
P456
ELECTRICAL CONTROL UNIT
S 95692 (C20)

FIGURE 13-43

13-7.2 REPLACE TEMPERATURE SENSOR 13-7.2

REMOVE

a. Turn off all electrical power.

b. Remove nut and washers holding temperature sensor to plenum, and remove sensor.

c. Remove evaporator electrical harness (PARA 13-5).

d. Remove tiedown straps from harness.

e. Remove temperature sensor wires from pins, N and P, of connector, P3.

f. Remove temperature sensor and its wires from electrical harness.

INSTALL

g. Turn off all electrical power.

h. Position sensor wires in harness wire bundle and install in pins, N and P, of connector, P3.

i. Install new tiedown straps, Item 360, Appendix D.

j. Install evaporator electrical harness (PARA 13-5).

k. Install sensor in plenum with washers and nut. **TIGHTEN NUT 1/6 TO 1/3 TURN BEYOND POINT WHERE SHARP RISE IN TORQUE IS FELT.**

l. Do an operational check of ECS (TM 55-1520-237-T).

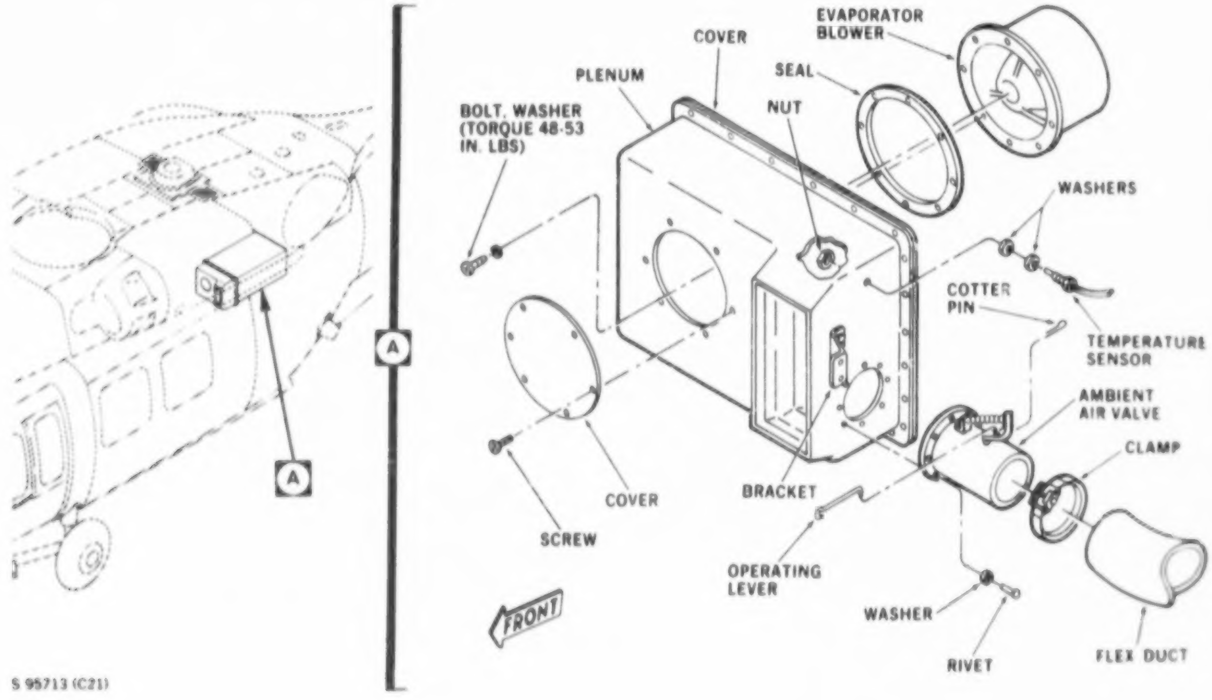

A
A
A
COVER
EVAPORATOR BLOWER
PLENUM
SEAL
BOLT, WASHER (TORQUE 48-53 IN. LBS)
NUT
WASHERS
COTTER PIN
TEMPERATURE SENSOR
AMBIENT AIR VALVE
CLAMP
COVER
BRACKET
SCREW
OPERATING LEVER
WASHER
RIVET
FLEX DUCT
FRONT
S 95713 (C21)

FIGURE 13-44

13-7.3 REPLACE TEMPERATURE LIMITING SWITCH 13-7.3

REMOVE

a. Turn off all electrical power.

b. Slit foam from around temperature limiting switch.

c. Remove screws and washers securing temperature limiting switch to heater/demister housing, and remove switch.

d. Disconnect and tag switch leads from terminals, 4 and 7, of terminal board, TB-4, and remove switch.

INSTALL

e. Turn off all electrical power.

f. Connect switch leads to terminals, 4 and 7, of terminal board, TB4.

g. Install switch to heater/demister housing with screws and washers. **TORQUE SCREWS TO 12 - 15 INCH-POUNDS.**

h. Repair foam insulation with sealant, Item 304, Appendix D. Replace if required.

i. Do an operational check of ECS (TM 55-1520-237-T).

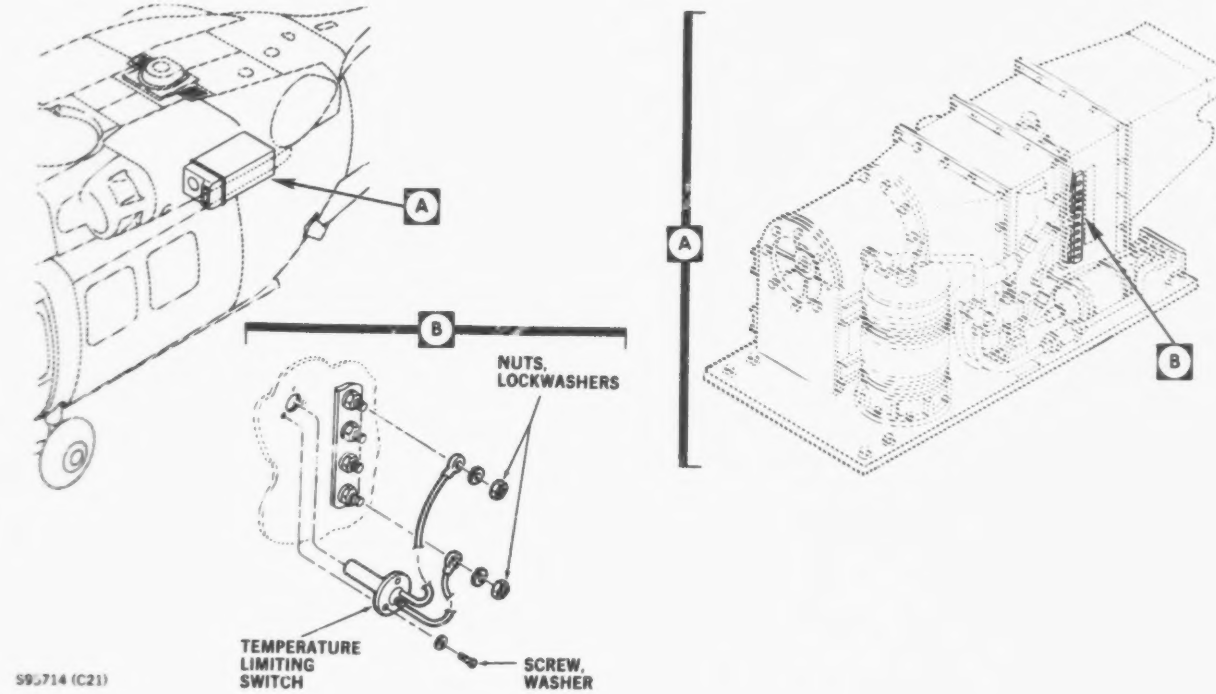


FIGURE 13-45

13-7.4 REPLACE LOW AND HIGH TEMPERATURE SWITCHES 13-7.4

REMOVE

a. Turn off all electrical power.

b. Slit foam from around low temperature switch.

c. Remove screws and washers securing low temperature switch to heater/demister housing, and remove switch.

d. Disconnect and tag low temperature switch leads from terminals, 8, 9, and 10, of terminal board, TB-4.

e. Disconnect and tag high temperature switch leads from terminals, 4, 5, and 6, of terminal board, TB-4.

f. Remove switches.

INSTALL

g. Turn off all electrical power.

h. Connect low temperature switch leads to terminals, 8, 9, and 10, of terminal board, TB-4.

i. Connect high temperature switch leads to terminals, 4, 5, and 6, of terminal board, TB-4.

j. Install switch to heater/demister housing with screws and washers. **TORQUE SCREWS TO 12 - 15 INCH-POUNDS.**

k. Repair foam insulation with sealant, Item 304, Appendix D. Replace if required.

l. Do an operational check of ECS (TM 55-1520-237-T).

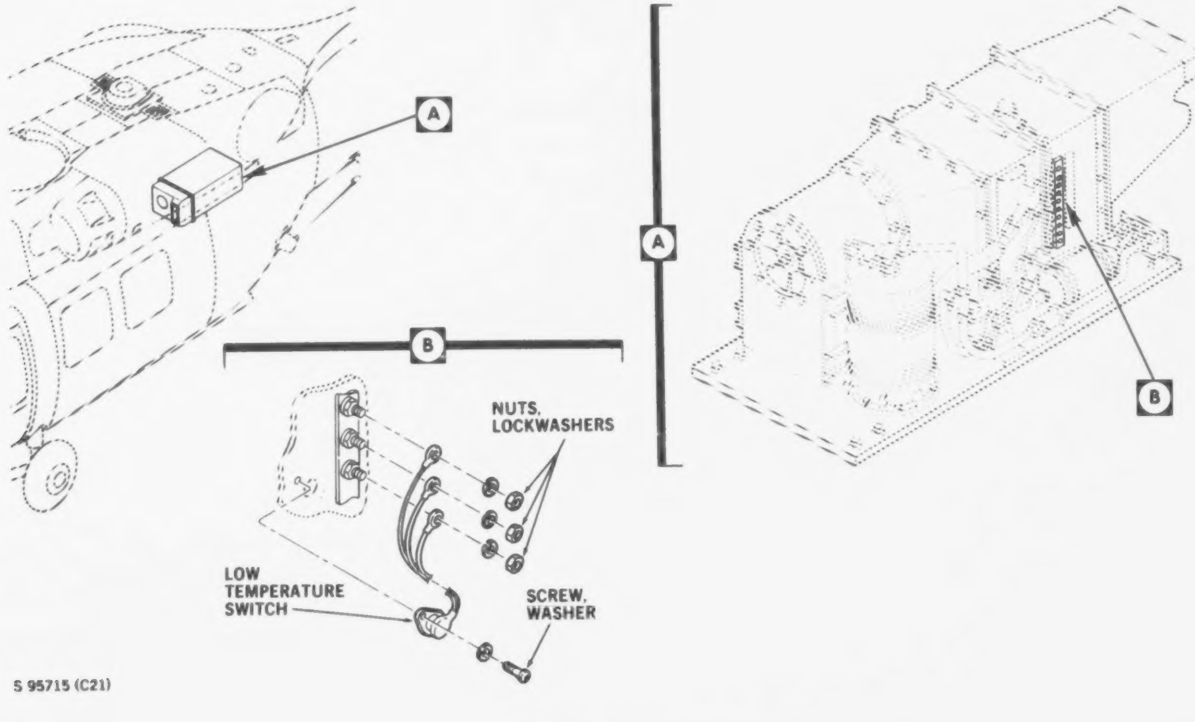
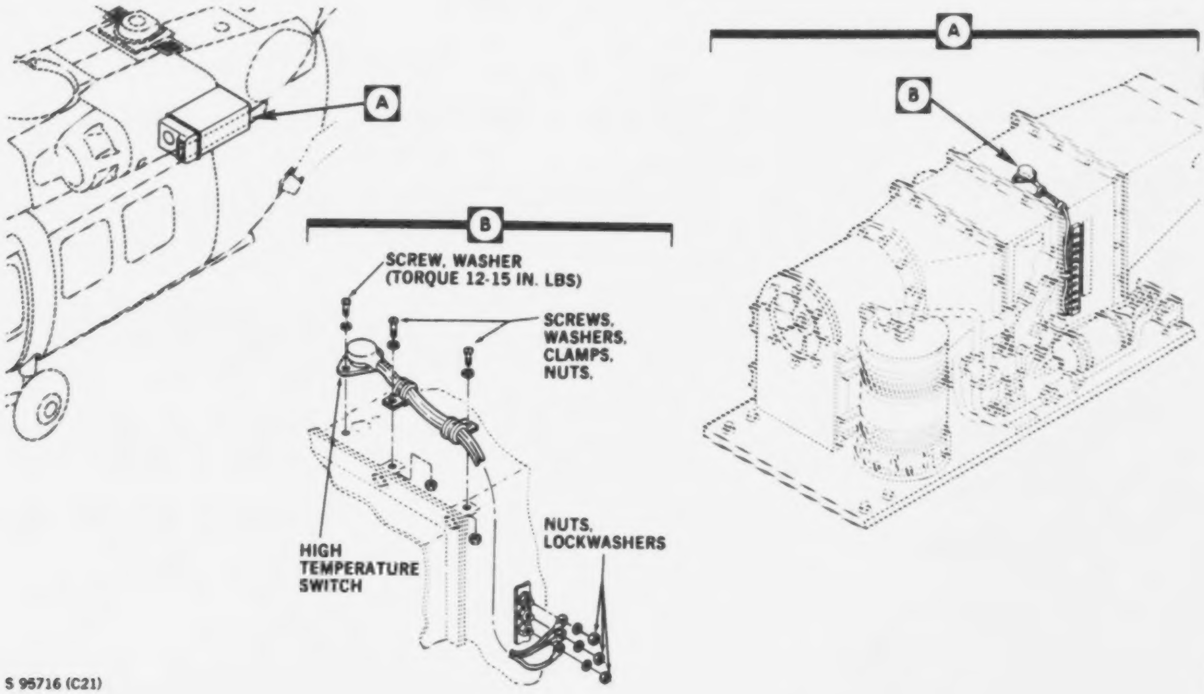


FIGURE 13-46

13-7.4 REPLACE LOW AND HIGH TEMPERATURE SWITCHES 13-7.4


A
A
B
B
SCREW, WASHER
(TORQUE 12-15 IN. LBS)
SCREWS,
WASHERS,
CLAMPS,
NUTS,
HIGH
TEMPERATURE
SWITCH
NUTS,
LOCKWASHERS

S 95716 (C21)

FIGURE 13-47

13-8 ECS PRESSURE SWITCHES (AVIM) 13-8

PARAGRAPH BREAKDOWN

13-8.1 REPLACE HIGH PRESSURE AND LOW PRESSURE SWITCHES (AVIM)

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 52C - Utility Equipment Repairer

TOOLS

- Refrigeration Unit Service Toolkit, SC 5180-90-CL-N18

REFERENCES

- PARA 1-4.1
- TM 55-1520-237-T

13-8.1 REPLACE HIGH AND LOW PRESSURE SWITCHES (AVIM) 13-8.1

REMOVE

a. Turn off all electrical power.

b. Deservice environmental control system (ECS) (PARA 1-4.1).

c. Disconnect electrical connector, P11, from electrical connector, J11, on high pressure switch.

d. Disconnect electrical connector, P12, from electrical connector, J12, on low pressure switch.

e. Remove both switches from the fittings on the servicing manifold.

NOTE

One or both fittings may come out with the switches. The fitting must then be removed from the switch for use with the replacement switch.

INSTALL

f. Turn off all electrical power.

g. If either fitting was removed from servicing manifold, install new packings and install fittings in servicing manifold.

h. Install switches in fittings.

i. Install connector, P11, to high pressure switch, and connector, P12, to low pressure switch.

j. Service air conditioner (PARA 1-4.1).

k. Do an operational check of ECS (TM 55-1520-237-T).

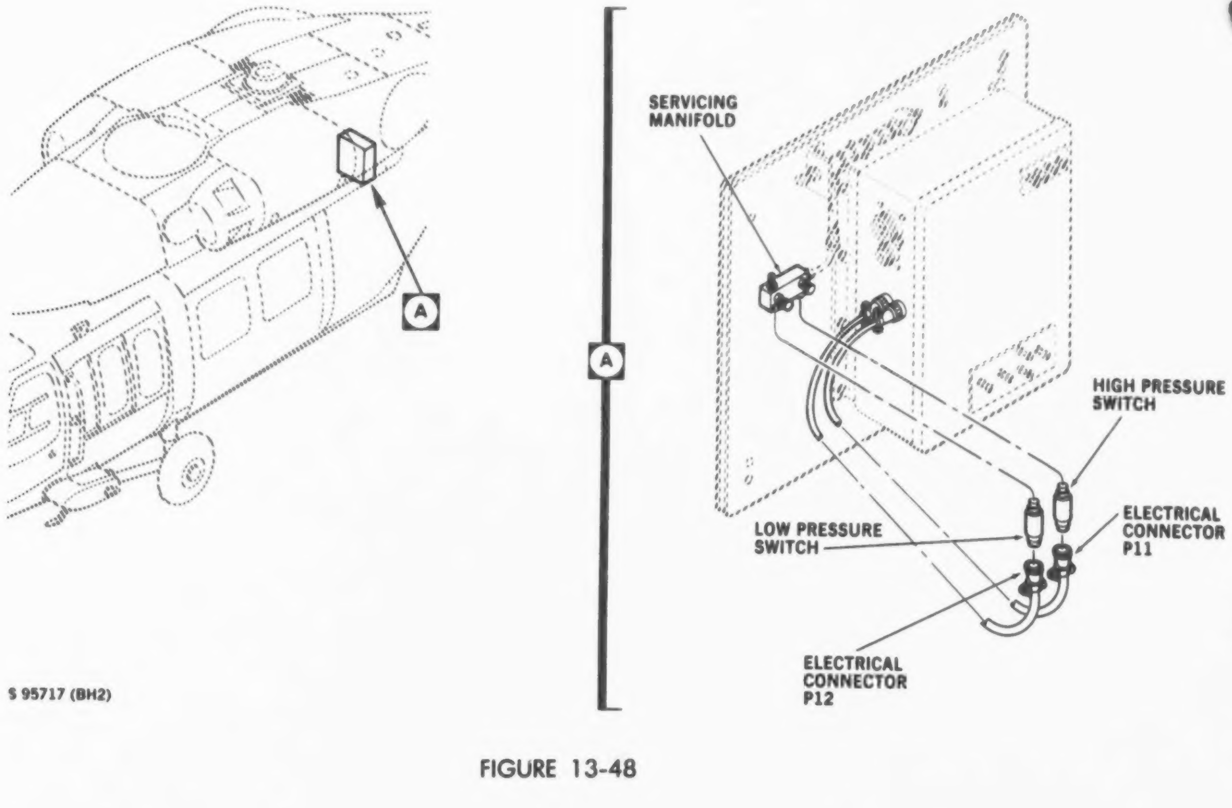

A
S 95717 (BH2)
SERVICING MANIFOLD
A
HIGH PRESSURE SWITCH
LOW PRESSURE SWITCH
ELECTRICAL CONNECTOR P11
ELECTRICAL CONNECTOR P12

FIGURE 13-48

CHAPTER 14

HOISTS AND WINCHES

(NOT APPLICABLE)

CHAPTER 15

AUXILIARY POWER PLANT SYSTEM

CHAPTER OVERVIEW

PARAGRAPH	TITLE	PAGE
15-1	Auxiliary Power Unit (APU) Front Support Mount-Repair	15-2
15-2	Auxiliary Power Unit (APU) Rear Support Mount-Repair	15-9
15-3	Auxiliary Power Unit (APU)	15-12
15-4	Auxiliary Power Unit (APU)-Repair	15-25
15-5	Auxiliary Power Unit (APU) Fuel System	15-36

15-1 AUXILIARY POWER UNIT (APU) FRONT SUPPORT MOUNT - REPAIR 15-1

PARAGRAPH BREAKDOWN

15-1.1 REPAIR APU FRONT SUPPORT MOUNT

15-1.2 REPLACE FRONT INBOARD SUPPORT MOUNT

15-1.3 REPLACE FRONT OUTBOARD SUPPORT MOUNT

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68G - Aircraft Structural Repairer
- One: - Assistant

MATERIALS/PARTS

- Epoxy Primer, Item 150, Appendix D
- Paint
- Primer, Item 277, Appendix D
- Sealing Compound, Item 312, Appendix D

TOOLS

- Airframe Repairer's Toolkit, SC 5180-99-CL-A02
- Blind Rivet Gun Kit, 35351
- Torque Wrench, 30-150 in. lb, GGG-W-00686

REFERENCES

- PARA 2-1
- PARA 2-5
- PARA 2-23
- PARA 2-32
- PARA 15-2
- PARA 15-3
- TM 55-1500-204-25/1
- TM 55-1500-345-23

15-1.1 REPAIR APU FRONT SUPPORT MOUNT 15-1.1

REPAIR

a. Front APU support mounts (inboard and outboard) include cadmium-plated 4130 steel tubular welded assemblies, 4130 steel attaching angles and bracket, and two aluminum alloy tee extrusion brackets.

b. Evaluate damage to aluminum parts (PARA 2-1). Damage greater than negligible limits to extrusion requires replacement of part. Replace worn bushing in tee brackets and press-fit wet with primer, Item 277, Appendix D.

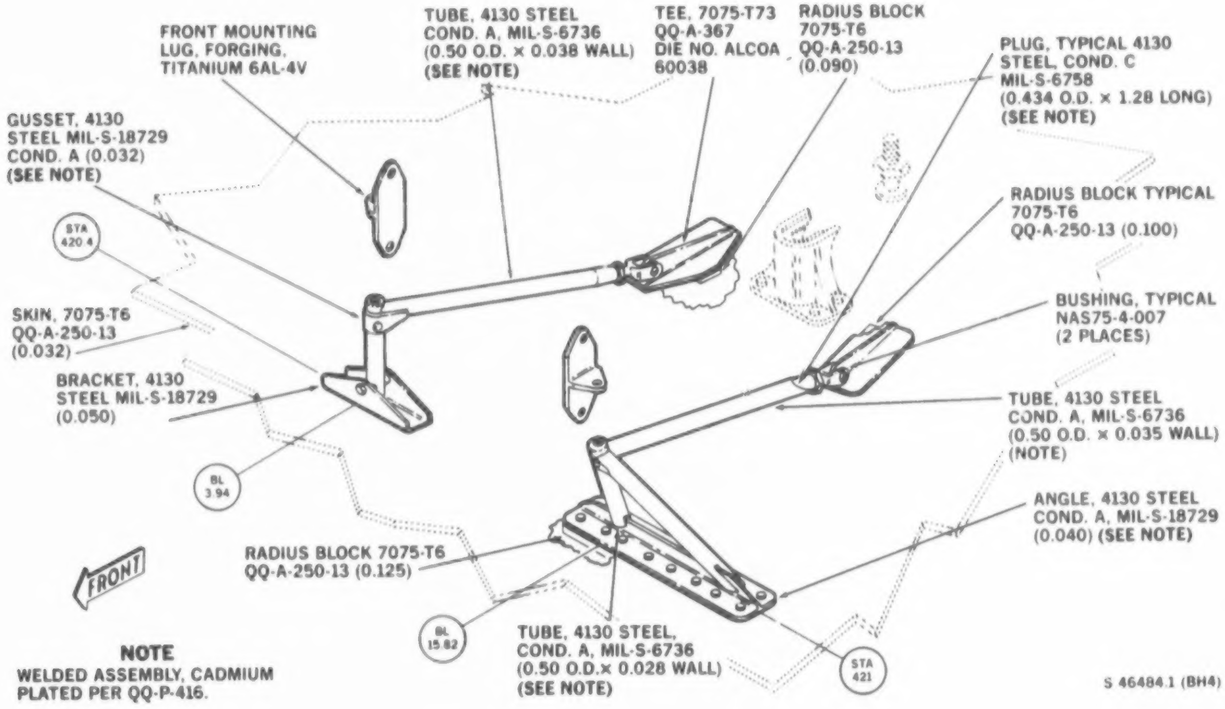
c. Evaluate damage and make repairs to steel welded assemblies (TM 55-1500-204-25/1).

d. Refer to PARA 15-3 for hoisting, removing, and replacing APU.

e. Refer to PARA 15-2 for rear mount repair information.

f. For corrosion protection and watertightness, seal support parts to structure (PARA 2-1).

g. Touch up paint as required (PARA 2-5 and TM 55-1500-345-23).


FRONT MOUNTING LUG, FORGING, TITANIUM 6AL-4V
TUBE, 4130 STEEL COND. A, MIL-S-6736 (0.50 O.D. × 0.038 WALL) (SEE NOTE)
TEE, 7075-T73 QQ-A-367 DIE NO. ALCOA 60038
RADIUS BLOCK 7075-T6 QQ-A-250-13 (0.090)
PLUG, TYPICAL 4130 STEEL, COND. C MIL-S-6758 (0.434 O.D. × 1.28 LONG) (SEE NOTE)
GUSSET, 4130 STEEL MIL-S-18729 COND. A (0.032) (SEE NOTE)
STA 420.4
RADIUS BLOCK TYPICAL 7075-T6 QQ-A-250-13 (0.100)
BUSHING, TYPICAL NAS75-4-007 (2 PLACES)
SKIN, 7075-T6 QQ-A-250-13 (0.032)
BRACKET, 4130 STEEL MIL-S-18729 (0.050)
TUBE, 4130 STEEL COND. A, MIL-S-6736 (0.50 O.D. × 0.035 WALL) (NOTE)
BL 3.94
ANGLE, 4130 STEEL COND. A, MIL-S-18729 (0.040) (SEE NOTE)
RADIUS BLOCK 7075-T6 QQ-A-250-13 (0.125)
FRONT
BL 15.82
TUBE, 4130 STEEL, COND. A, MIL-S-6736 (0.50 O.D.× 0.028 WALL) (SEE NOTE)
STA 421
S 46484.1 (BH4)

NOTE
WELDED ASSEMBLY, CADMIUM PLATED PER QQ-P-416.

FIGURE 15-1 (SHEET 1 OF 2)

15-1.1 REPAIR APU FRONT SUPPORT MOUNT

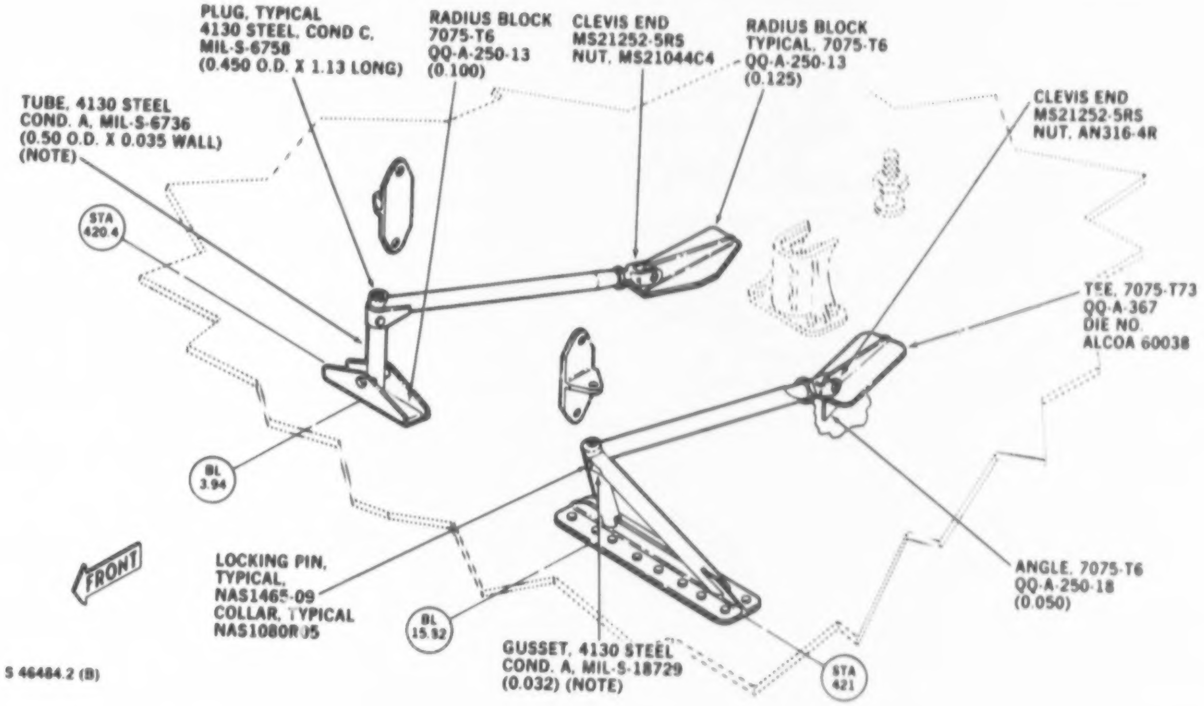

PLUG, TYPICAL
4130 STEEL, COND C,
MIL-S-6758
(0.450 O.D. X 1.13 LONG)
RADIUS BLOCK
7075-T6
QQ-A-250-13
(0.100)
CLEVIS END
MS21252-5RS
NUT, MS21044C4
RADIUS BLOCK
TYPICAL, 7075-T6
QQ-A-250-13
(0.125)
TUBE, 4130 STEEL
COND. A, MIL-S-6736
(0.50 O.D. X 0.035 WALL)
(NOTE)
CLEVIS END
MS21252-5RS
NUT, AN316-4R
STA
420.4
TEE, 7075-T73
QQ-A-367
DIE NO.
ALCOA 60038
BL
3.94
FRONT
LOCKING PIN,
TYPICAL,
NAS1465-09
COLLAR, TYPICAL
NAS1080R05
BL
15.52
GUSSET, 4130 STEEL
COND. A, MIL-S-18729
(0.032) (NOTE)
STA
421
ANGLE, 7075-T6
QQ-A-250-18
(0.050)
S 46484.2 (B)

FIGURE 15-1 (SHEET 2 OF 2)

15-1.2 REPLACE FRONT INBOARD SUPPORT MOUNT 15-1.2

REMOVE

a. Hinge open APU compartment doors.

b. Remove bolt and washer securing forward mounting lug to inboard mount installation.

c. Place wooden block under APU sump, or use sling to support APU (PARA 15-3).

d. Remove bolt, washer, and nut securing mounting tube to bracket.

e. Remove cotter pin, nut, washer, and clevis bolt attaching clevis end to tee assembly.

f. Remove inboard support mount welded assembly.

NOTE

To get to rear compartment, remove rear troop seats, remove soundproofing panel from left stowage compartment, and unhook cargo netting.

g. Position assistant inside rear compartment to remove collars from pin fasteners and to install new fasteners.

h. Remove four Hi-Lok fasteners securing bracket to upper plating support structure (TM 55-1500-204-25/1).

i. Remove bracket and radius block.

j. Remove five lockbolts securing tee assembly to upper plating support structure (TM 55-1500-204-25/1). Carefully drill out and remove three rivets using No. 24 (0.152-inch diameter) drill and 1/8-inch-diameter drive pin punch.

k. Remove tee assembly and radius blocks.

l. Clean up rivet debris and touch up damaged protective finishes (PARA 2-5 and TM 55-1500-345-23).

INSTALL

m. For corrosion protection and waterproofing, seal all support parts to structure during assembly (PARA 2-1).

n. Position replacement bracket and radius block on upper plating support structure and hold in place with 5/32-inch-diameter sheetmetal hole holders in two holes.

o. Install required Hi-Lok fasteners (Figure 15-2) in between hole holders, using instructions in TM 55-1500-204-25/1.

p. Remove hole holders and install remaining Hi-Lok fasteners.

q. Position tee assembly on upper plating support structure and radius blocks under plating. Hold in place with 5/32-inch-diameter sheetmetal hole holders in two end holes on long side and center hole on tapered side.

s. Install required lockbolts on long side and rivets on tapered side (Figure 15-2) in between hole holders, using instructions in TM 55-1500-204-25/1.

t. Remove hole holders and install remaining fasteners.

u. Assistant to clean up rivet debris, remove tools, and secure items removed for entry into aft compartment, per PARA 16-13.

v. Position inboard support mount (welded assembly) in bracket and tee. Attach front tube to bracket with AN4C13 bolt, AN960-416L washer, and MS21044C4 nut.

w. Loosen jamnut and adjust clevis end to line up with hole in tee assembly. Attach clevis end with clevis bolt AN24-13, AN960-416L washer, AN310-4 nut, and MS9245-27 cotter pin.

15-1.2 REPLACE FRONT INBOARD SUPPORT MOUNT 15-1.2

x. Tighten jamnut.

y. Line up front mounting tube with front mounting lug on APU. Remove wooden block or sling supporting APU.

z. Install MS21094-4004 bolt and AN960-416 washer.

aa. **TORQUE BOLT TO 104-116 INCH-POUNDS**

ab. Remove tools and clean up area.

ac. Clean and seal for corrosion protection and waterproofing (PARA 2-1).

ad. Touch up paint as required (PARA 2-5 and TM 55-1500-345-23).

ae. Close and secure APU compartment doors.

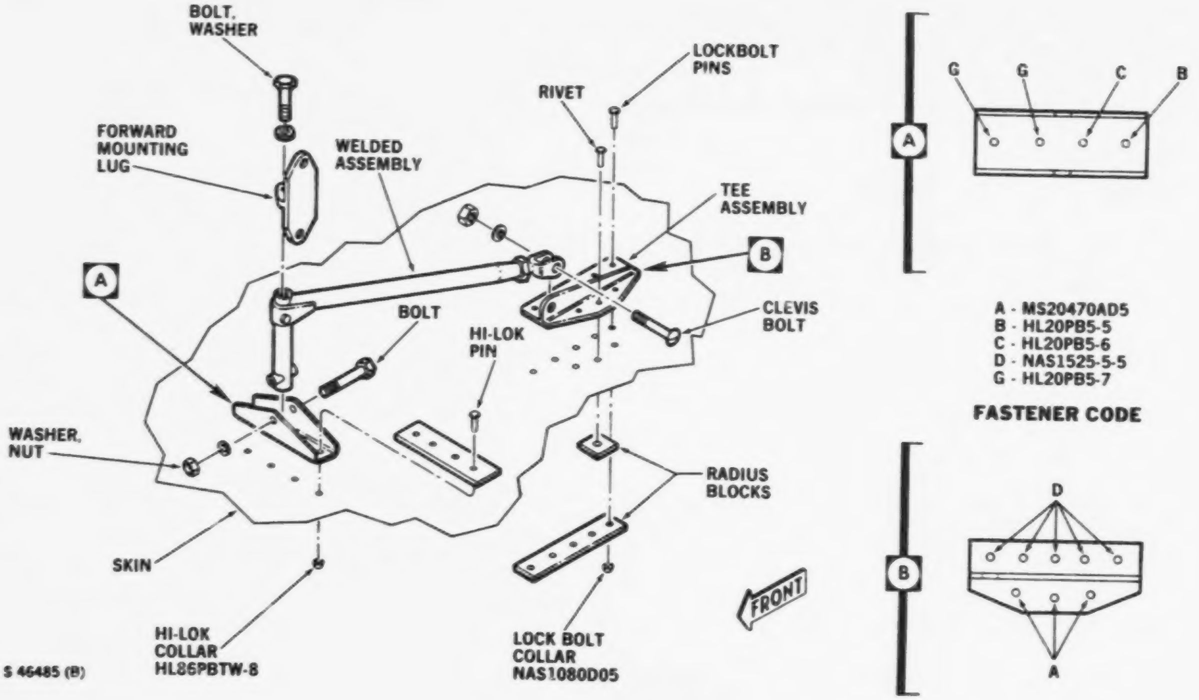

BOLT, WASHER
LOCKBOLT PINS
RIVET
FORWARD MOUNTING LUG
WELDED ASSEMBLY
TEE ASSEMBLY
B
A
BOLT
HI-LOK PIN
CLEVIS BOLT
WASHER, NUT
RADIUS BLOCKS
SKIN
FRONT
HI-LOK COLLAR HL86PBTW-8
LOCK BOLT COLLAR NAS1080D05
S 46485 (B)
A
G
G
C
B
A - MS20470AD5
B - HL20PB5-5
C - HL20PB5-6
D - NAS1525-5-5
G - HL20PB5-7
FASTENER CODE
B
D
A

FIGURE 15-2

15-1.3 REPLACE FRONT OUTBOARD SUPPORT MOUNT 15-1.3

REMOVE

a. Hinge open APU compartment doors.

b. Remove bolt and washer securing front mounting lug to outboard mount installation.

c. Place wooden block under APU sump, or use sling to support APU (PARA 15-3).

d. Remove cotter pin, nut, washer, and clevis bolt attaching clevis end to tee assembly.

e. Remove rear troop seats, soundproofing panel and unhook cargo netting (PARA 2-23 and 2-32).

f. Have assistant inside rear compartment to remove collars from pin fasteners and to install new fasteners.

g. Remove eight Hi-Lok fasteners securing angles to upper plating support structure (TM 55-1500-204-25/1). Carefully drill out and remove eight rivets using No. 24 (0.152-inch diameter) drill and 1/8-inch-diameter drive pin punch.

h. Remove outboard support mount welded assembly and radius blocks.

i. Remove 10 lockbolts securing tee assembly to upper plating support structure.

j. Remove tee assembly and radius blocks.

k. Clean up rivet debris and touch up damaged protective finishes (PARA 2-5 and TM 55-1500-345-23).

INSTALL

l. Position tee assembly on upper plating support structure, with required radius blocks under plating. Hold in place with 5/32-inch-diameter sheet metal hole holders in four end holes.

m. Install required lockbolts (Figure 15-3) in between hole holders, using installation instructions (TM 55-1500-204-25/1).

n. Remove hole holders and install remaining fasteners.

o. Position outboard support mount (welded assembly) on upper plating support structure and required radius blocks under plating. Hold in place with 5/32-inch-diameter sheet metal hole holders in three places, on angles, for each radius block.

p. Install required Hi-Lok fasteners and rivets (Figure 15-3) in between hole holders, using installation instructions (TM 55-1500-204-25/1).

q. Remove hole holders and install remaining fasteners.

r. Assistant to clean up rivet debris, remove tools, and secure items removed for entry into rear compartment (PARA 2-23 and 2-32).

s. Loosen jamnut and adjust clevis end to line up with hole in tee assembly. Attach clevis end with clevis bolt AN24-13, AN960-416L washer, AN310-4 nut, and MS9245-27 cotter pin.

t. Tighten jamnut.

u. Line up front mounting tube with front mounting lug on APU. Remove wooden block or sling supporting APU.

v. Install MS21094-4004 bolt and AN960-416 washer.

w. **TORQUE BOLT TO 104 - 116 INCH-POUNDS.**

x. Remove tools and clean up area.

y. For corrosion protection and waterproofing, seal support mount parts to structure (PARA 2-1).

z. Touch up paint as required (PARA 2-5 and TM 55-1500-345-23).

aa. Close and secure APU compartment doors.

best copy available

15-1.3 REPLACE FRONT OUTBOARD SUPPORT MOUNT 15-1.3

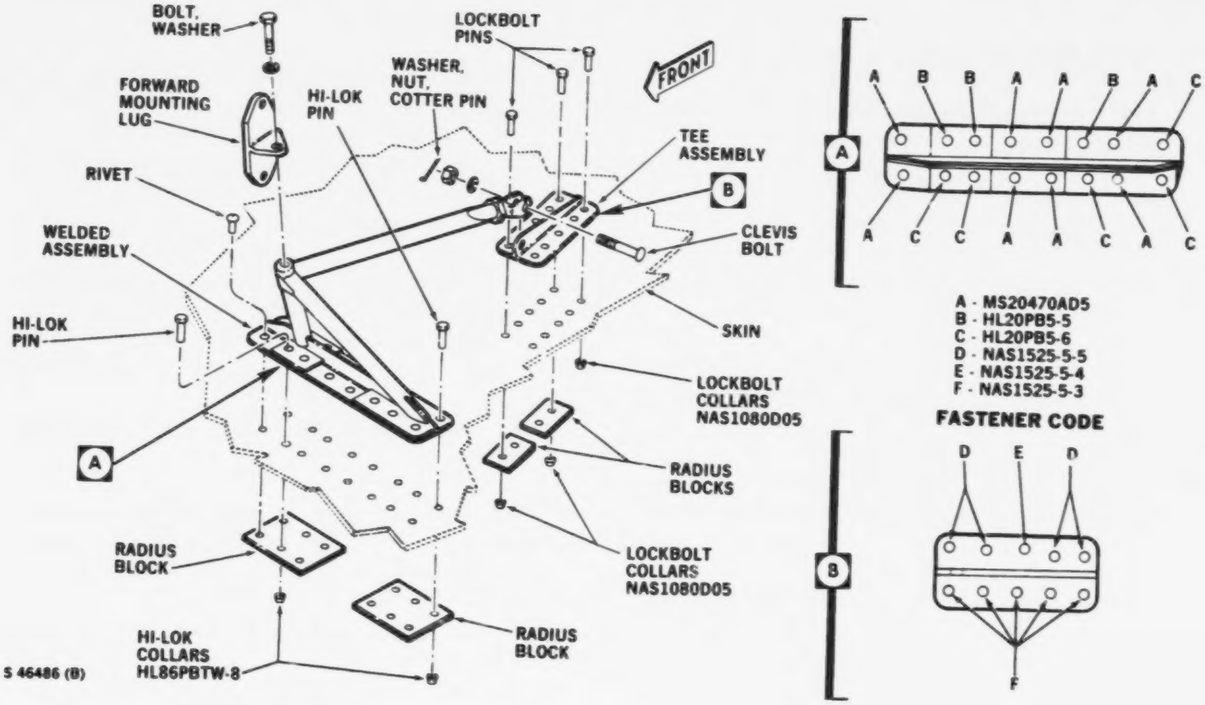

BOLT, WASHER
LOCKBOLT PINS
FRONT
WASHER, NUT, COTTER PIN
FORWARD MOUNTING LUG
HI-LOK PIN
TEE ASSEMBLY
B
RIVET
CLEVIS BOLT
WELDED ASSEMBLY
HI-LOK PIN
SKIN
LOCKBOLT COLLARS NAS1080D05
A
RADIUS BLOCKS
RADIUS BLOCK
LOCKBOLT COLLARS NAS1080D05
HI-LOK COLLARS HL86PBTW-8
RADIUS BLOCK
S 46486 (B)
A
A B B A A B A C
A C C A A C A C
A - MS20470AD5
B - HL20PB5-5
C - HL20PB5-6
D - NAS1525-5-5
E - NAS1525-5-4
F - NAS1525-5-3
FASTENER CODE
B
D E D
F

FIGURE 15-3

15-2 AUXILIARY POWER UNIT (APU) REAR SUPPORT MOUNT - REPAIR 15-2

PARAGRAPH BREAKDOWN

15-2.1 REPAIR APU REAR SUPPORT MOUNT

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 68G - Aircraft Structural Repairer
- One: - Assistant

MATERIALS/PARTS

- Abrasive Cloth, Item 5, Appendix D
- Epoxy Primer, Item 150, Appendix D
- Sealing Compound, Item 312, Appendix D

TOOLS

- Airframe Repairer's Tool Kit, SC 5180-99-CL-A02

REFERENCES

- PARA 2-1
- PARA 2-2
- PARA 2-5
- TM 55-1500-345-23

15-2.1 REPAIR APU REAR SUPPORT MOUNT 15-2.1

REPAIR

a. The APU rear mount consists of a mounting lug attached to the APU and a support fitting fastened to the transition section upper plating at station 433.44. The mounting lug, which engages the support fitting, is made from 17-4PH corrosion-resistant steel, and threaded to screw into the APU base. The support fitting, made from 17-4PH steel casting, is attached to the upper plating support structure with Hi-Lok fasteners (HL20PB5-3/HL86PBTW-8). The support structure, made from formed aluminum alloy sheet stock, reinforces the area between stringers for attaching the support fitting.

b. Evaluate damage to the support structure using PARA 2-1.

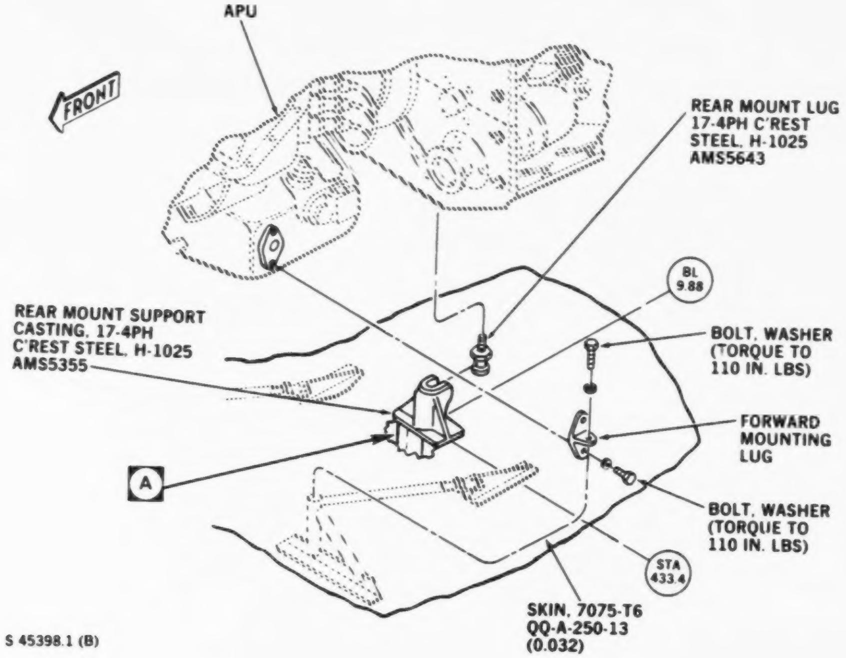

APU
FRONT
REAR MOUNT LUG
17-4PH C'REST
STEEL, H-1025
AMS5643
BL
9.88
REAR MOUNT SUPPORT
CASTING, 17-4PH
C'REST STEEL, H-1025
AMS5355
BOLT, WASHER
(TORQUE TO
110 IN. LBS)
FORWARD
MOUNTING
LUG
A
BOLT, WASHER
(TORQUE TO
110 IN. LBS)
STA
433.4
SKIN, 7075-T6
QQ-A-250-13
(0.032)
S 45398.1 (B)

FIGURE 15-4 (SHEET 1 OF 2)

15-2.1 REPAIR APU REAR SUPPORT MOUNT 15-2.1

c. Negligible damage to the mounting lug and support fitting is limited to nicks, scratches, and abrasions or wear, no deeper than 5% of material thickness at point of damage. Blend damage smoothly to surrounding area and polish with 240-grit abrasive cloth, Item 5, Appendix D. Damage greater than negligible limits must be reviewed by engineering authority for damage evaluation and either repair or replacement.

d. Use PARA 2-2 for typical support structure repair.

e. Refer to PARA 15-1 for forward mount repair information.

f. Refer to PARA 15-3 for hoisting, removing, or replacing APU.

g. For corrosion protection and watertightness, seal support parts to structure (PARA 2-1).

h. Touch up paint as required (PARA 2-5 and TM 55-1500-345-23).

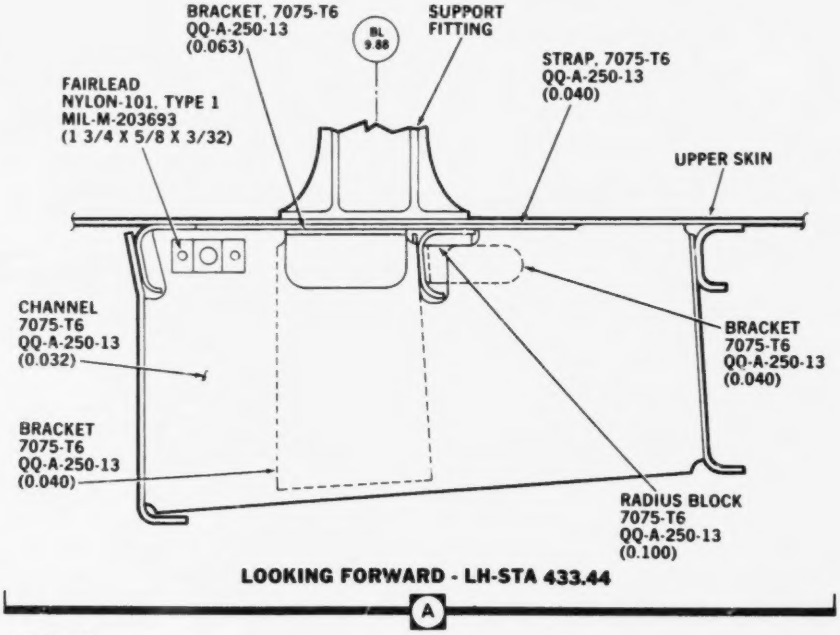

BRACKET, 7075-T6
QQ-A-250-13
(0.063)
BL
9.88
SUPPORT
FITTING
STRAP, 7075-T6
QQ-A-250-13
(0.040)
FAIRLEAD
NYLON-101, TYPE 1
MIL-M-203693
(1 3/4 X 5/8 X 3/32)
UPPER SKIN
CHANNEL
7075-T6
QQ-A-250-13
(0.032)
BRACKET
7075-T6
QQ-A-250-13
(0.040)
BRACKET
7075-T6
QQ-A-250-13
(0.040)
RADIUS BLOCK
7075-T6
QQ-A-250-13
(0.100)
LOOKING FORWARD - LH-STA 433.44
A
S 45398.2 (B)

FIGURE 15-4 (SHEET 2 OF 2)

15-3 AUXILIARY POWER UNIT (APU) 15-3

PARAGRAPH BREAKDOWN

15-3.1	REMOVE APU
15-3.2	INSTALL APU
15-3.3	SERVICE APU
15-3.4	PRESERVE/DEPRESERVE APU

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- Two: - Assistants

MATERIALS/PARTS

- Antiseize Compound, Item 78, Appendix D
- Gasket, MS9136-01
- Grease, Item 169, Appendix D
- Lockwire, Item 199, Appendix D
- Lockwire, Item 198, Appendix D
- Lubricating Oil, Item 221 or 225, Appendix D
- Packing, NAS 1595-6
- Saddle Washer
- Sealant Compound, Item 303, Appendix D
- Sealing Compound, Item 312, Appendix D

TOOLS

- Adapter Assembly, 70700-20423-041
- Aircraft Mechanic's Tool Kit, SC 5180-99-CL-A01
- Hoist, to Support Weight of APU (150 lbs).
- Hoisting Sling Assembly, 70700-20323-041
- Maintenance Crane, 70700-20300-042 (Alternate For Hoist)
- Maintenance Trailer
- 1-Gallon Container
- Protective Plugs
- Tags
- Torque Wrench, 0 - 30 in.. lbs., GGG-W-00686
- Torque Wrench, 30 - 150 in. lbs., GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs., GG-W-00686

REFERENCES

- Appendix E
- PARA 7-1
- PARA 18-1
- TM 55-1520-237-T
- TM 55-2835-208-23

15-3.1 REMOVE APU 15-3.1

REMOVE

a. If removing APU for storage or AVIM level maintenance, preserve APU (PARA 15-3.4).

b. If maintenance crane, 70700-20300-042, is to be used, assemble and set up crane (PARA 18-1).

c. Turn off all electrical power.

d. Remove APU compartment doors from helicopter.

e. Unclamp generator wiring from airframe.

f. Disconnect electrical connector from fire detector on rear panel.

g. Loosen stud fasteners, or remove screws, securing fuel control cover to fuel control base. Remove cover.

CAUTION

To avoid damage to fuel filter, union inside fuel control base must be held with a wrench when disconnecting fuel inlet hose.

h. Holding union inside base with a wrench, disconnect fuel inlet hose.

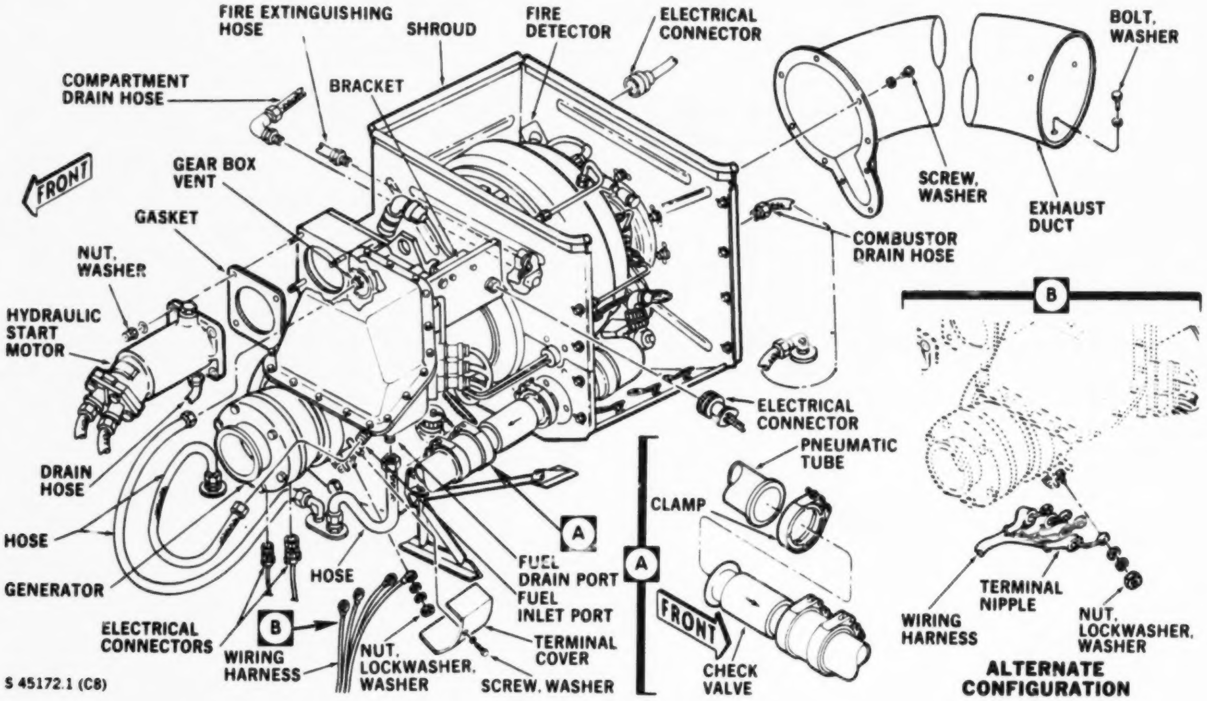

FIRE EXTINGUISHING HOSE
SHROUD
FIRE DETECTOR
ELECTRICAL CONNECTOR
BOLT, WASHER
COMPARTMENT DRAIN HOSE
BRACKET
FRONT
GEAR BOX VENT
GASKET
SCREW, WASHER
EXHAUST DUCT
COMBUSTOR DRAIN HOSE
NUT, WASHER
HYDRAULIC START MOTOR
B
ELECTRICAL CONNECTOR
PNEUMATIC TUBE
DRAIN HOSE
CLAMP
A
HOSE
A
FUEL DRAIN PORT
FUEL INLET PORT
GENERATOR
HOSE
FRONT
TERMINAL NIPPLE
ELECTRICAL CONNECTORS
B
WIRING HARNESS
NUT, LOCKWASHER, WASHER
TERMINAL COVER
SCREW, WASHER
CHECK VALVE
WIRING HARNESS
NUT, LOCKWASHER, WASHER
ALTERNATE CONFIGURATION
S 45172.1 (C8)

FIGURE 15-5 (SHEET 1 OF 4)

15-3.1 REMOVE APU 15-3.1

i. Disconnect hoses from drain ports, gear box vent, compartment drain, combustor drain, and fire extinguishing hose. Plug hoses and cover ports.

j. Remove nuts, washers, hydraulic start motor, and gasket from APU.

k. Tie hydraulic start motor to beam. Make sure hoses are not kinked.

l. Disconnect electrical connectors from generator and bracket.

m. Remove screws holding exhaust duct to shroud. Remove bolts holding exhaust duct to airframe fairing.

n. Unclamp check valve from pneumatic tube at front panel half firewall.

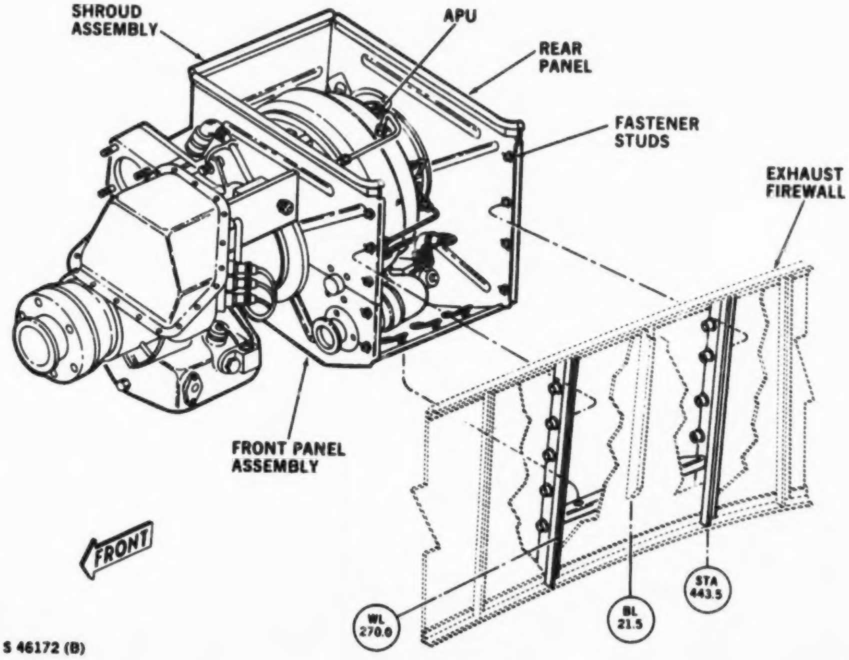

SHROUD ASSEMBLY
APU
REAR PANEL
FASTENER STUDS
EXHAUST FIREWALL
FRONT PANEL ASSEMBLY
FRONT
WL 270.0
BL 21.5
STA 443.5
S 46172 (B)

FIGURE 15-5 (SHEET 2 OF 4)

15-3.1 REMOVE APU 15-3.1

o. If new APU is to be installed, install fuel control cover on fuel control base. Lock and secure cover with stud fasteners or screws.

NOTE

APU shroud assembly is secured to engine exhaust firewall at station 443.5, waterline 270.0, buttline 21.5.

p. Release fastener studs securing shroud assembly panels to exhaust firewall.

NOTE

Make sure APU (with shroud assembly) is separated from engine exhaust firewall.

q. Install hoisting sling, 70700-20323-041, on APU. Attach sling to maintenance crane or to a hoist with enough capacity to lift APU (150 pounds). Take up slack.

r. Remove bolts securing front mounting lugs to front supports. Operate hoist/crane that will support full weight of APU.

s. Slide APU to rear, disengaging rear mounting lug from rear support fitting. Raise APU up enough to disconnect generator wiring.

t. If terminal cover is installed, remove it, or slide terminal nipples back on wiring harness leads. Tag and disconnect wiring harness leads from terminals on generator.

WARNING

To prevent injury to personnel or damage to equipment, do not use crane as a source of excessive force to free APU from helicopter. Make sure crane hook does not touch pulley when lifting APU from helicopter, as this may damage the cable.

u. With assistant operating hoist/crane, remove APU from helicopter. Unbolt front mounting lugs from APU gear box sump. Install on adapter assembly, 70700-20423-041, on maintenance trailer. If adapter assembly/maintenance trailer is not available, support APU to prevent damage to components on bottom of APU.

NOTE

If APU is being replaced because of internal failure, check pneumatic system for possible metal contamination. (PARA 7-1).

v. Remove screws holding cover halves around bleed air outlet flange. Remove cover halves from lower front panel half.

w. Remove bolts, washers, and firewall sleeves.

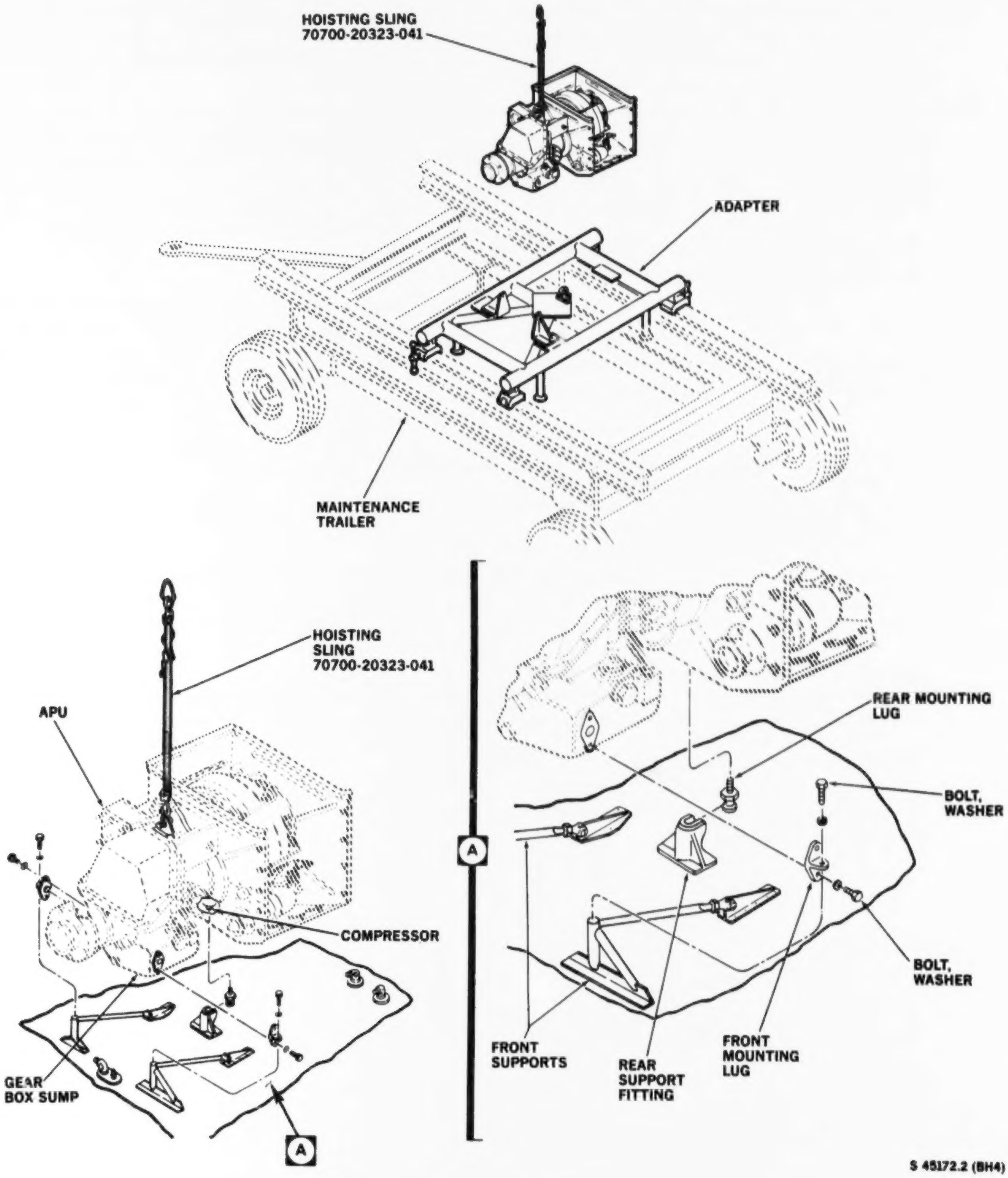

HOISTING SLING
70700-20323-041
ADAPTER
MAINTENANCE
TRAILER
HOISTING
SLING
70700-20323-041
APU
COMPRESSOR
GEAR
BOX SUMP
A
A
REAR MOUNTING
LUG
BOLT,
WASHER
BOLT,
WASHER
FRONT
SUPPORTS
REAR
SUPPORT
FITTING
FRONT
MOUNTING
LUG
S 45172.2 (BH4)

FIGURE 15-5 (SHEET 3 OF 4)

15-3.1 REMOVE APU 15-3.1

x. Loosen band clamp holding front panel halves together.

y. Unscrew and remove rear mounting lug from shroud assembly.

z. Remove screws holding front panel halves to shroud. Remove front panel halves.

aa. Remove shroud assembly (with rear panel) surrounding APU hot section.

ab. Remove combustor drain.

NOTE

During a APU engine change involving the replacement of a 116305-100 engine with a 116305-200 engine keep the combustor drain line.

ac. Remove packing from APU combustor fuel drain check valve. Cover port.

ad. Loosen clamp and remove exhaust pipe from APU.

ae. Loosen clamp bolt on QAD mount clamp and remove generator from APU.

af. Remove nuts, washers, QAD mount and gasket from APU.

ag. Unbolt tube from start bypass valve. Cover port.

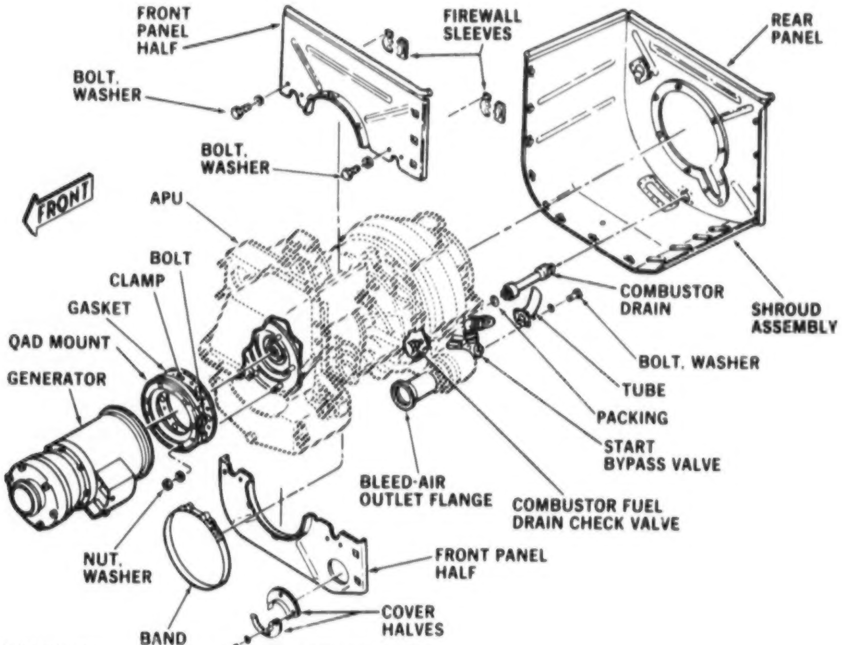

FRONT PANEL HALF
FIREWALL SLEEVES
REAR PANEL
BOLT, WASHER
BOLT, WASHER
FRONT
APU
BOLT
CLAMP
GASKET
QAD MOUNT
GENERATOR
COMBUSTOR DRAIN
SHROUD ASSEMBLY
BOLT, WASHER
TUBE
PACKING
START BYPASS VALVE
BLEED-AIR OUTLET FLANGE
COMBUSTOR FUEL DRAIN CHECK VALVE
NUT, WASHER
FRONT PANEL HALF
COVER HALVES
BAND CLAMP
SCREW, WASHER
S 45172.3 (C4)

FIGURE 15-5 (SHEET 4 OF 4)

15-3.2 INSTALL APU 15-3.2

INSTALL

a. Depreserve APU (PARA 15-3.4).

b. Place gasket, MS9136-01, and QAD mount on APU. Install with QAD mount bolt on left side of APU. Install washers and nuts. **TORQUE NUTS IN A CRISS-CROSS PATTERN TO 50 INCH-POUNDS; THEN TO 150 INCH-POUNDS; THEN TO 250 INCH-POUNDS; THEN TORQUE NUTS TO A FINAL TORQUE OF 261 - 289 INCH-POUNDS.**

c. Install generator (TM 55-2835-208-23).

d. Remove port cover and bolt tube to start bypass valve. **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts together.

e. Apply a coat of antiseize compound, Item 78, Appendix D, around inside clamping surface of exhaust pipe.

f. Place exhaust pipe on flange of APU.

g. Make sure exhaust pipe does not overlap APU exhaust case doubler. **TORQUE CLAMP BOLT TO 35 - 40 INCH-POUNDS.**

h. Tap clamping surface lightly with nonmetallic hammer. **RETORQUE CLAMP BOLT TO 35 - 40 INCH-POUNDS.**

i. Continue tapping clamping surface until two successive trials show no loss in torque.

j. Remove port cover, and install packing, NAS 1595-6, on APU combustor fuel drain check valve.

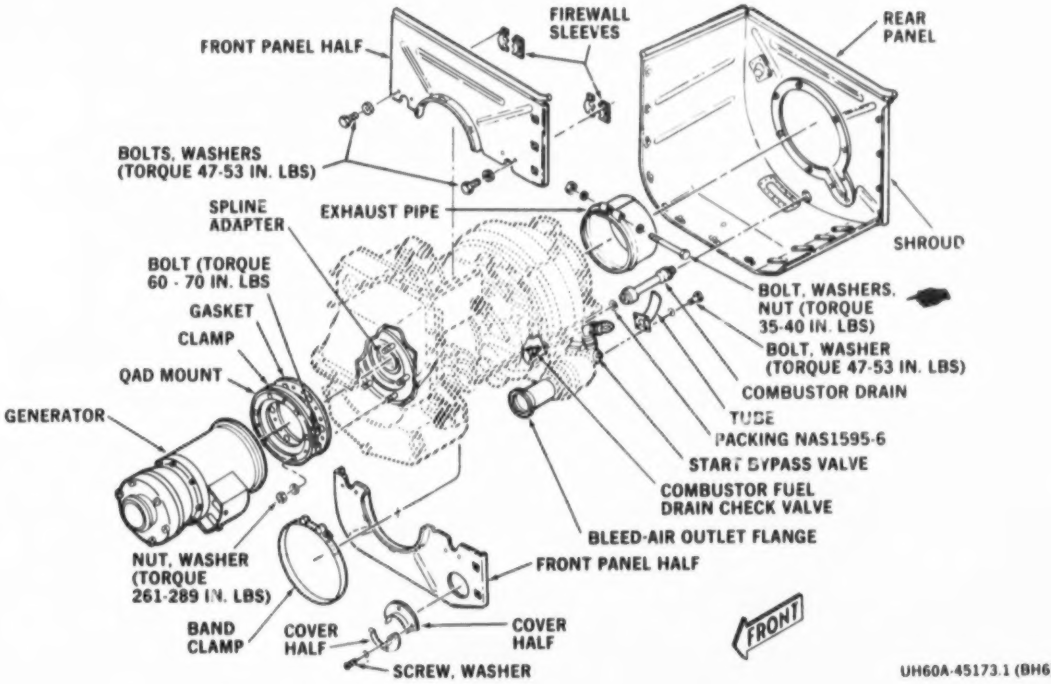

FIREWALL SLEEVES
REAR PANEL
FRONT PANEL HALF
BOLTS, WASHERS (TORQUE 47-53 IN. LBS)
SPLINE ADAPTER
EXHAUST PIPE
SHROUD
BOLT (TORQUE 60 - 70 IN. LBS
GASKET
CLAMP
QAD MOUNT
GENERATOR
BOLT, WASHERS, NUT (TORQUE 35-40 IN. LBS)
BOLT, WASHER (TORQUE 47-53 IN. LBS)
COMBUSTOR DRAIN TUBE
PACKING NAS1595-6
START BYPASS VALVE
COMBUSTOR FUEL DRAIN CHECK VALVE
BLEED-AIR OUTLET FLANGE
FRONT PANEL HALF
NUT, WASHER (TORQUE 261-289 IN. LBS)
BAND CLAMP
COVER HALF
COVER HALF
SCREW, WASHER
FRONT
UH60A-45173.1 (BH6)

FIGURE 15-6 (SHEET 1 OF 4)

k. Install shroud assembly (with rear panel) around APU hot section.

l. Insert combustor drain through hole in rear panel. Thread drain onto APU combustor fuel drain check valve. Lockwire, Item 198, Appendix D, drain to rear panel.

CAUTION

Make sure ignition lead, thermocouple lead, and wiring for valves and switches are positioned to prevent chafing and pinching when panel halves are installed.

m. Place front panel halves on APU and fasten to each other by installing band clamp around front panel halves.

n. Position leads and electrical wiring inside firewall sleeves, and install sleeves to front panel halves with bolts and washers. **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts together.

NOTE

Lockwire bolts only on right side sleeves (looking forward).

o. Place cover halves around bleed air outlet flange, and fasten to lower front panel with washers and screws.

p. Thread rear mounting lug into APU compressor. **TORQUE LUG TO 133 - 147 INCH-POUNDS.** Lockwire, Item 198, Appendix D, lug to shroud assembly.

q. Install hoisting sling, 70700-20323-041, on APU. Attach sling to hoist crane. Take up slack.

WARNING

To prevent injury to personnel or damage to equipment, do not use crane as a source of excessive force to free APU from engine adapter. Make sure crane hook does not touch pulley when lifting APU from adapter, as this may damage the cable.

r. With assistants operating hoist/crane, support full weight of APU; then unbolt and disengage APU from adapter assembly, 70700-20423-041.

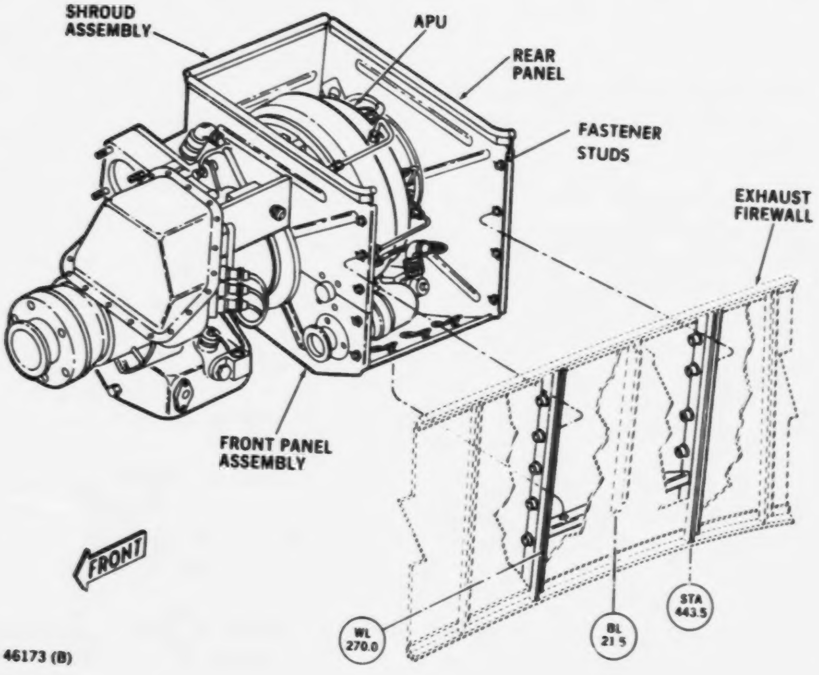
s. Bolt front mounting lugs with top side up to APU gear box sump. **TORQUE BOLTS TO 104 - 116 INCH-POUNDS.**

t. Raise APU up and lower into compartment enough to connect wiring to generator.

u. Connect wiring harness leads to terminals on generator and remove tags. Install terminal nipples over terminals, or install terminal cover and lockwire, Item 198, Appendix D, screws.

v. Connect electrical connectors to generator and APU.

15-3.2 INSTALL APU 15-3.2


SHROUD ASSEMBLY
APU
REAR PANEL
FASTENER STUDS
EXHAUST FIREWALL
FRONT PANEL ASSEMBLY
FRONT
WL 270.0
BL 21.5
STA 443.5

S 46173 (B)

FIGURE 15-6 (SHEET 2 OF 4)

15-3.2 INSTALL APU 15-3.2

w. Engage rear mounting lug in rear support fitting, and slide APU forward along engine exhaust firewall.

x. Attach APU shroud assembly panels to exhaust firewall, and twist lock fastener studs.

y. Bolt forward mounting lugs to forward supports. **TORQUE BOLTS TO 104 - 116 INCH-POUNDS.**

z. Install exhaust duct on shroud rear panel flange with washers and screws.

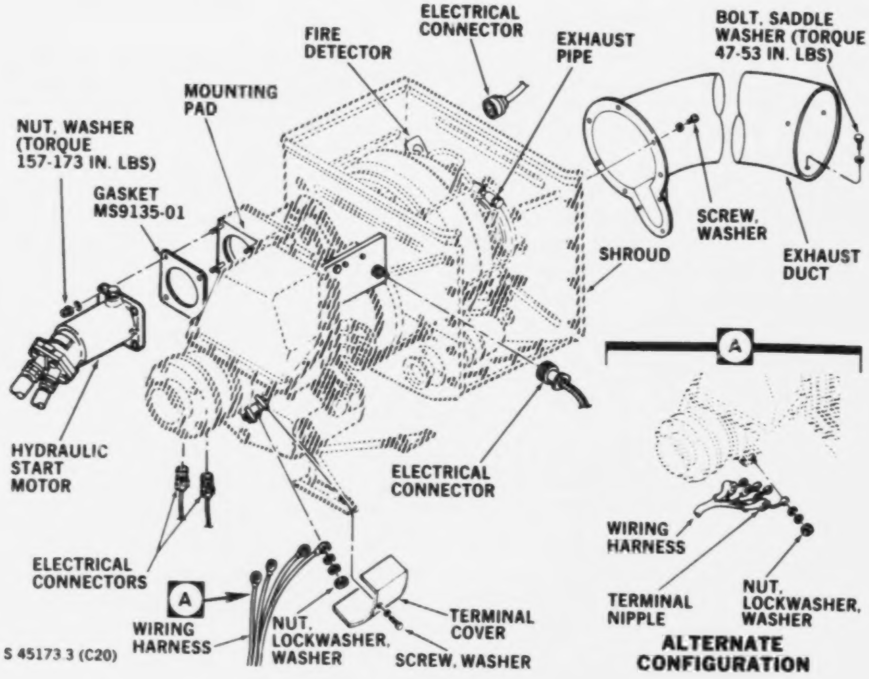

ELECTRICAL CONNECTOR
FIRE DETECTOR
EXHAUST PIPE
BOLT, SADDLE WASHER (TORQUE 47-53 IN. LBS)
MOUNTING PAD
NUT, WASHER (TORQUE 157-173 IN. LBS)
GASKET MS9135-01
SCREW, WASHER
SHROUD
EXHAUST DUCT
A
HYDRAULIC START MOTOR
ELECTRICAL CONNECTOR
WIRING HARNESS
ELECTRICAL CONNECTORS
A
TERMINAL NIPPLE
NUT, LOCKWASHER, WASHER
ALTERNATE CONFIGURATION
WIRING HARNESS
NUT, LOCKWASHER, WASHER
TERMINAL COVER
SCREW, WASHER
S 45173.3 (C20)

FIGURE 15-6 (SHEET 3 OF 4)

15-3.2 INSTALL APU

aa. Attach exhaust duct to APU panel with bolts and washers, **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.**

ab. Seal all seams and joined areas of enclosure formed by shroud assembly and exhaust firewall with sealant, Item 303, Appendix D.

ac. Connect electrical connector to fire detector on rear panel.

ad. Install gasket on hydraulic start motor mounting pad.

ae. Install hydraulic start motor on APU with washers and nuts. **TORQUE NUTS TO 157 - 173 INCH-POUNDS.**

af. Unplug and connect hoses at APU fire extinguishing elbow, compartment drain, combustor drain, gear box vent, and fuel drain port on fuel control enclosure.

CAUTION

To prevent damage to fuel filter, take care not to overtighten B-nut when installing fuel hose.

ag. Clamp APU check valve to pneumatic tube at front panel half firewall with coupling. **TORQUE COUPLING TO 35 - 45 INCH-POUNDS.**

ah. If fuel control cover was not previously removed, loosen stud fasteners, or remove screws, securing fuel control cover to fuel control base. Remove cover.

CAUTION

To avoid damage to fuel filter, union inside fuel control base must be held with a wrench when installing fuel inlet hose.

ai. Holding union inside base with a wrench, unplug and loosely connect fuel inlet hose to union under fuel control base.

aj. If bonding jumper was removed from fuel inlet hose, position clamp on hose and connect bonding jumper to clamp with screw, washers, and nut.

ak. Connect bonding jumper to airframe with screw, lockwasher, washers, and nut.

al. Seal area around screw and airframe with sealing compound, Item 312, Appendix D.

15-3.2 INSTALL APU 15-3.2

am. Prime APU fuel line (PARA 15-5).

an. Clamp generator wiring to airframe.

ao. Check wire harness, fuel, and drain lines for contact. If contact occurs, reposition wire harness and/or fuel and drain lines. Fasten, using extra clamps as required.

ap. Make sure area is free of foreign objects, then install APU compartment doors.

aq. Do an operational check of APU (TM 55-1520-237-T).

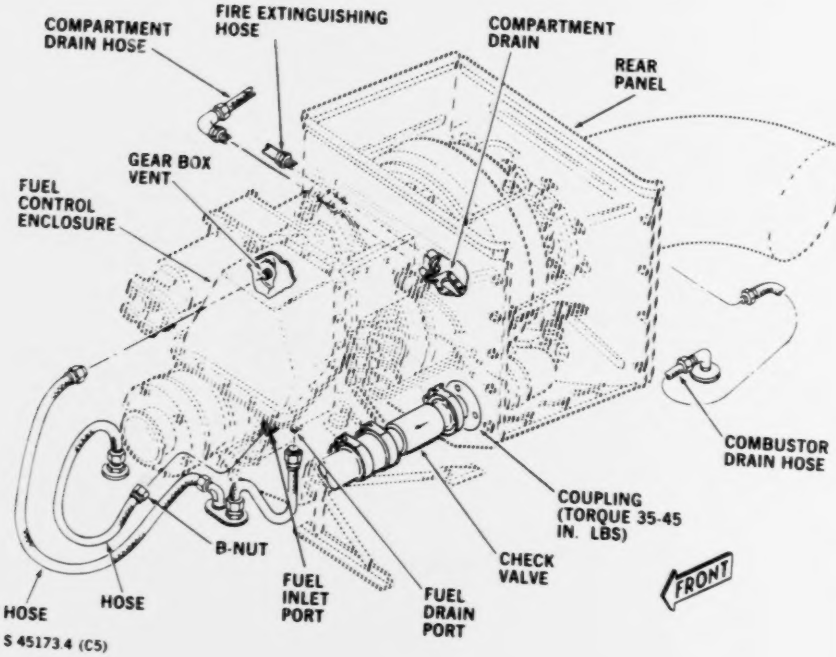

COMPARTMENT DRAIN HOSE
FIRE EXTINGUISHING HOSE
COMPARTMENT DRAIN
REAR PANEL
GEAR BOX VENT
FUEL CONTROL ENCLOSURE
COMBUSTOR DRAIN HOSE
COUPLING (TORQUE 35-45 IN. LBS)
CHECK VALVE
FRONT
B-NUT
FUEL INLET PORT
FUEL DRAIN PORT
HOSE
HOSE
S 45173.4 (C5)

FIGURE 15-6 (SHEET 4 OF 4)

15-3.3 SERVICE APU 15-3.3

SERVICE

Service APU (PARA 1-4.1). Unlatch and hinge open APU compartment door.

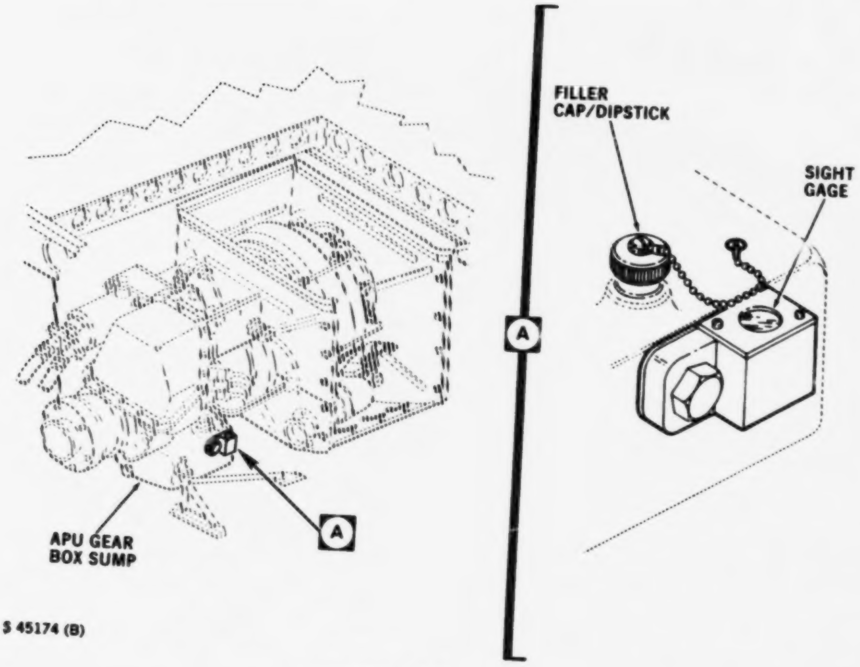

FILLER CAP/DIPSTICK
SIGHT GAGE
A
A
APU GEAR BOX SUMP
S 45174 (B)

FIGURE 15-7

15-3.4 PRESERVE/DEPRESERVE APU 15-3.4

PRESERVE

a. Preserve APU using procedures for short-term storage (Appendix E).

DEPRESERVE

b. Depreserve APU using procedures for short-term storage (Appendix E).

15-4 AUXILIARY POWER UNIT (APU) - REPAIR 15-4

PARAGRAPH BREAKDOWN

15-4.1 REPLACE EXHAUST DUCT

15-4.2 REPLACE EXHAUST PIPE

15-4.3 REPLACE SHROUD ASSEMBLY

15-4.4 REPLACE MOUNTING LUGS

15-4.5 REPLACE START MOTOR

15-4.6 REPLACE SPLINE ADAPTER

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: MOS 68B - Aircraft Powerplant Repairer

MATERIALS/PARTS

- Adhesive, RTV730
- Antiseize Compound, Item 78, Appendix D
- Gasket, MS9135-01
- Grease, Item 163, Appendix D
- Grease, Item 169, Appendix D
- Hydraulic Fluid, item 174, Appendix D
- Hydraulic Fluid, Item 172, Appendix D
- Lockwire, Item 202, Appendix D
- Lockwire, Item 203, Appendix D
- Packing, MS28778-4
- Petrolatum, Item 259, Appendix D
- Retainer, MS28773-4
- Sealant, Item 303, Appendix D

TOOLS

- Aircraft Mechanic's Tool Kit, SC 5180-99-CL-A01
- Powertrain Tool Kit, SC 5180-99-CL-A13
- Protective Plugs and Caps
- Puller Kit, Mechanical, GGG-P-781
- Tags
- Torque Wrench, 0 - 30 in.. lbs., GGG-W-00686
- Torque Wrench, 150 - 750 in. lbs., GG-W-00686
- Wood supporting block (wedge)

REFERENCES

- PARA 7-2
- PARA 7-5
- PARA 15-3
- TM 55-1520-237-T

15-4.1 REPLACE EXHAUST DUCT 15-4.1

REMOVE EXHAUST DUCT

a. Turn off all electrical power.

b. Unlatch and hinge open APU compartment doors.

c. Remove screws and washers from exhaust duct mounting flange.

d. Unbolt exhaust duct from airframe fairing.

e. Pull duct through fairing until flange reaches fairing. Rotate duct until flange finger points forward. Remove duct.

NOTE

Exhaust pipe can be replaced with APU (PARA 15-3).

INSTALL EXHAUST DUCT

f. Turn off all electrical power.

g. With finger on mounting flange pointing forward, install exhaust duct through airframe fairing.

h. Apply a bead on sealant, Item 303, Appendix D to mounting flange, and install exhaust duct to rear shroud with screws and washers.

i. Secure exhaust duct to airframe fairing with bolts and saddle washers. **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.**

j. Make sure compartment areas are free of foreign objects.

k. Close and latch APU compartment doors.

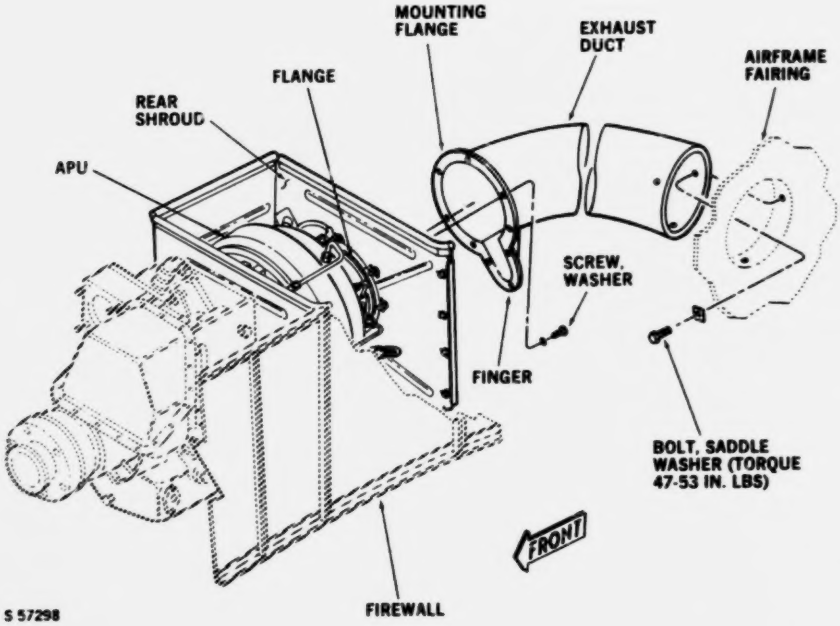

MOUNTING FLANGE
EXHAUST DUCT
AIRFRAME FAIRING
FLANGE
REAR SHROUD
APU
SCREW, WASHER
FINGER
BOLT, SADDLE WASHER (TORQUE 47-53 IN. LBS)
FRONT
FIREWALL
S 57298

FIGURE 15-8

15-4.2 REPLACE EXHAUST PIPE 15-4.2

REMOVE

a. Turn off all electrical power.

b. Loosen exhaust pipe clamp bolt.

c. Slide exhaust pipe out through exhaust duct.

INSTALL

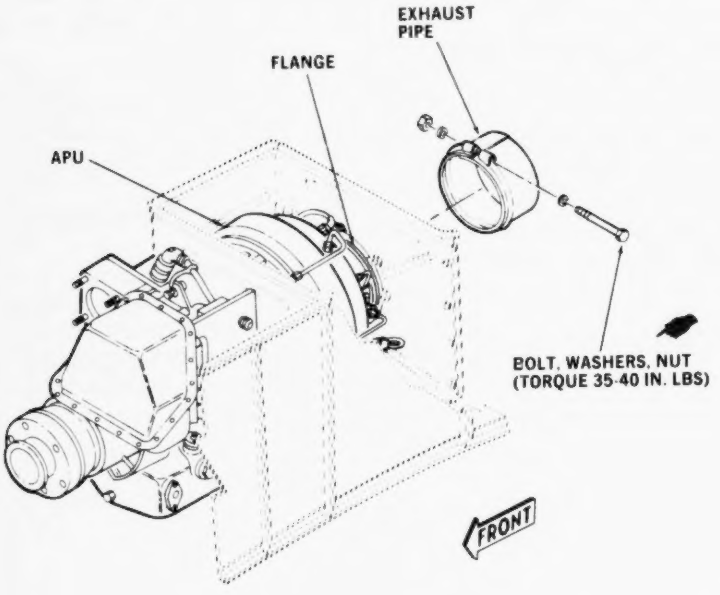
d. Turn off all electrical power.

e. Coat internal beaded surface of exhaust pipe with antiseize compound, Item 78, Appendix D.

f. Pass exhaust pipe up through exhaust duct. Position pipe on APU flange. **TORQUE CLAMP BOLT TO 35 - 40 INCH-POUNDS.**

g. Tap around clamp with a plastic mallet. **CHECK CLAMP BOLT TORQUE FOR 35 - 40 INCH-POUNDS.** Continue taping and checking clamp bolt torque until two successive trials show no loss of torque.

h. Check area for cleanness and foreign materials.



UH60A-94409 (BH6)

FIGURE 15-9

15-4.3 REPLACE SHROUD ASSEMBLY 15-4.3

REMOVE

a. Turn off all electrical power.

b. Remove APU from helicopter (PARA 15-3).

c. Remove bolts, washers, and firewall sleeves.

d. Loosen and remove band clamp holding upper and lower front firewall panel halves together.

e. Remove screws holding cover halves around bleed-air outlet flange. Remove cover halves from lower front panel half.

f. Remove screws holding front panel halves to shroud assembly. Remove front panel halves.

g. Remove lockwire from combuster drain in rear panel.

h. Loosen and remove aft mounting lug from compressor.

i. Remove shroud assembly surrounding APU hot section, carefully sliding off combustor drain.

INSTALL

j. Install shroud assembly around APU hot section.

k. Install aft mounting lug in APU compressor. **TORQUE LUG TO 133 - 147 INCH-POUNDS.** Lockwire, Item 198, Appendix D, lug to shroud assembly.

l. Lockwire, Item 198, Appendix D, combustor drain to cover on rear panel.

m. Seal shroud assembly with sealant, Item 303, Appendix D (PARA 15-3).

CAUTION

Make sure ignition lead, thermocouple lead, and wiring for valves and switches is positioned to prevent chafing and pinching when panel halves are installed.

n. Place upper and lower front panels on APU and fasten front panel halves to shroud with washers and screws.

o. Install band clamp around front panel halves.

p. Position leads and electrical wiring inside firewall sleeves and install firewall sleeves to front panel halves with bolts and washers. **TORQUE BOLTS TO 47 - 53 INCH-POUNDS.** Lockwire, Item 199, Appendix D, bolts together.

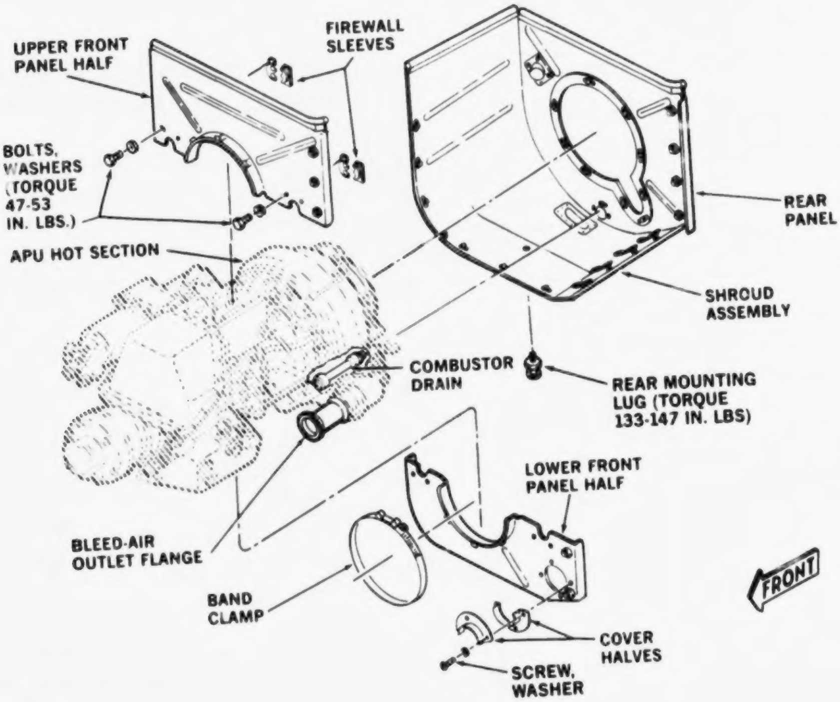
15-4.3 REPLACE SHROUD ASSEMBLY 15-4.3

NOTE

Lockwire bolts only on right side sleeves (looking forward).

q. Place cover halves around bleed-air outlet flange, and fasten to lower front panel with washers and screws.

r. Install APU in helicopter (PARA 15-3).


UPPER FRONT PANEL HALF
FIREWALL SLEEVES
BOLTS, WASHERS (TORQUE 47-53 IN. LBS.)
APU HOT SECTION
REAR PANEL
SHROUD ASSEMBLY
COMBUSTOR DRAIN
REAR MOUNTING LUG (TORQUE 133-147 IN. LBS)
LOWER FRONT PANEL HALF
BLEED-AIR OUTLET FLANGE
BAND CLAMP
FRONT
COVER HALVES
SCREW, WASHER

S 45177 (BH4)

FIGURE 15-10

15-4.4 REPLACE MOUNTING LUGS 15-4.4

REMOVE RIGHT FRONT MOUNTING LUG

a. Turn off all electrical power.

b. Unlatch and hinge open APU compartment door.

c. Use wood wedge to block up APU under gear box sump to relieve APU weight from forward supports, or install sling on APU and attach to maintenance crane or hoist. Take up slack to support weight of APU.

d. Remove washer and bolt securing forward RH mounting lug to forward inboard support.

e. Remove washers and bolts securing RH mounting lug to APU gear box sump, and remove mounting lug.

INSTALL RIGHT FRONT MOUNTING LUG

f. Turn off all electrical power.

g. Install forward RH mounting lug ("TOP" side up) to APU gear box sump with washers and bolts. **TORQUE BOLTS TO 104 - 116 INCH-POUNDS.**

h. Remove wood wedge under APU gear box sump.

i. Secure RH mounting lug to forward inboard support with washer and bolt. **TORQUE BOLT TO 104 -116 INCH-POUNDS.**

j. Make sure area is free of foreign objects.

k. Close and latch APU compartment door.

REMOVE LEFT FRONT MOUNTING LUG

l. Turn off all electrical power.

m. Unlatch and hinge open APU compartment door.

n. Use wood wedge to block up APU under gear box sump to relieve APU weight from forward supports.

o. Remove washer and bolt securing forward LH mounting lug to forward outboard support.

p. Remove washers and bolts securing LH mounting lug to APU gear box sump, and remove mounting lug.

INSTALL LEFT FRONT MOUNTING LUG

q. Turn off all electrical power.

r. Install forward LH mounting lug ("TOP" side up) to APU gear box sump with washers and bolts. **TORQUE BOLTS TO 104 - 116 INCH-POUNDS.**

s. Remove wood wedge under APU gear box sump.

t. Secure LH mounting lug to forward outboard support with washer and bolt. **TORQUE BOLT TO 104 -116 INCH-POUNDS.**

u. Make sure area is free of foreign objects.

v. Close and latch APU compartment door.

15-4.4 REPLACE MOUNTING LUGS 15-4.4

REMOVE REAR MOUNTING LUG

w. Turn off all electrical power.

x. Remove APU (PARA 15-3).

y. Loosen and remove AFT mounting from APU compressor.

INSTALL REAR MOUNTING LUG

z. Turn off all electrical power.

aa. Install aft mounting lug, in APU compressor. **TORQUE LUG TO 133 - 147 INCH-POUNDS.** Lockwire, Item 198, Appendix D, lug to shroud assembly.

ab. Install APU (PARA 15-3).

ac. Make sure area is free of foreign objects.

ad. Close and latch APU compartment door.

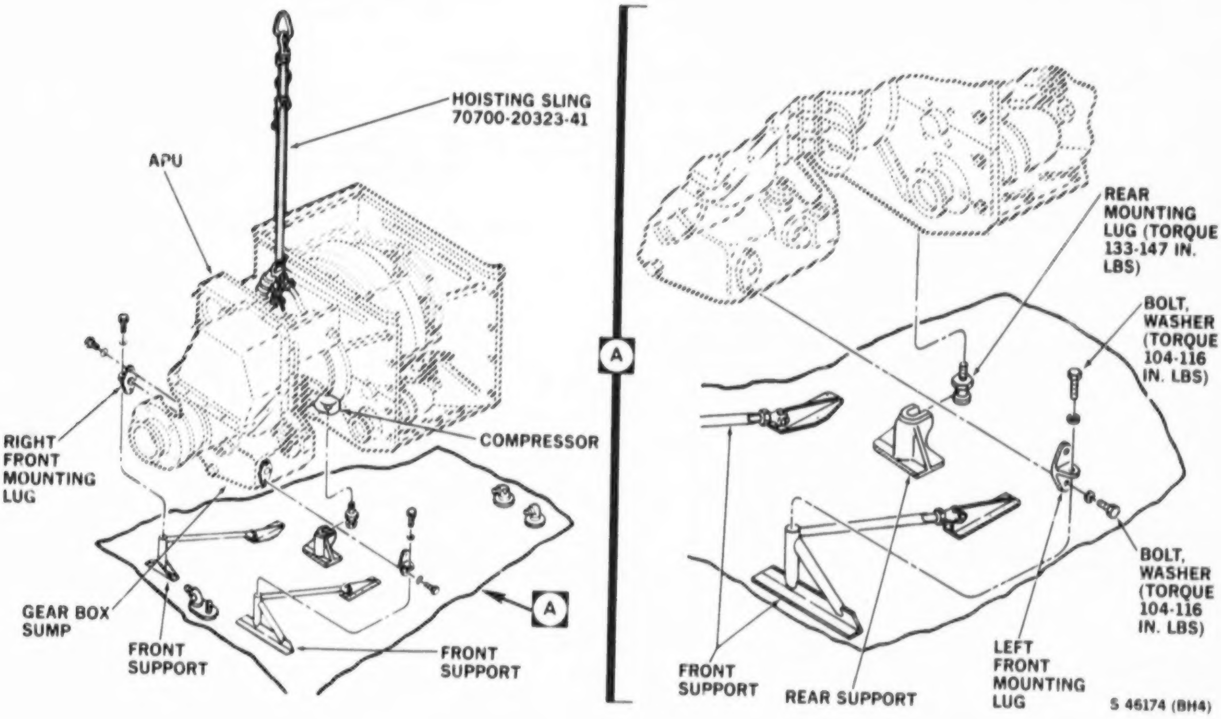

HOISTING SLING 70700-20323-41
APU
RIGHT FRONT MOUNTING LUG
COMPRESSOR
GEAR BOX SUMP
FRONT SUPPORT
FRONT SUPPORT
A
A
REAR MOUNTING LUG (TORQUE 133-147 IN. LBS)
BOLT, WASHER (TORQUE 104-116 IN. LBS)
BOLT, WASHER (TORQUE 104-116 IN. LBS)
FRONT SUPPORT
REAR SUPPORT
LEFT FRONT MOUNTING LUG
S 46174 (BH4)

FIGURE 15-11

15-4.5 REPLACE START MOTOR 15-4.5

REMOVE

a. Turn off all electrical power.

WARNING

Place tag on APU start valve in cabin misection overhead warning personnel not to manually operate start valve as start motor is being replaced.

b. Unlatch and hinge open APU compartment door.

c. Remove hoses from PRESS and RETURN ports on start motor. Cap ports on motor and plug hoses.

d. Disconnect drain hose from union on start motor. Cap port and plug drain hose.

e. Remove nuts, start motor, and gasket from APU.

f. Remove union, packing, and retainer from start motor.

NOTE

If experiencing interference between plug and solar unit cover, replace with low profile plug.

g. **TORQUE PLUG TO 60 - 65 INCH-POUNDS.** Lockwire, Item 203, Appendix D, plug to start motor body.

INSPECT

h. Drive shaft shall not measure less than 0.735 inches when two 0.096-inch pins are placed on splines.

i. See PARA 7-2 for shaft seal leakage limits.

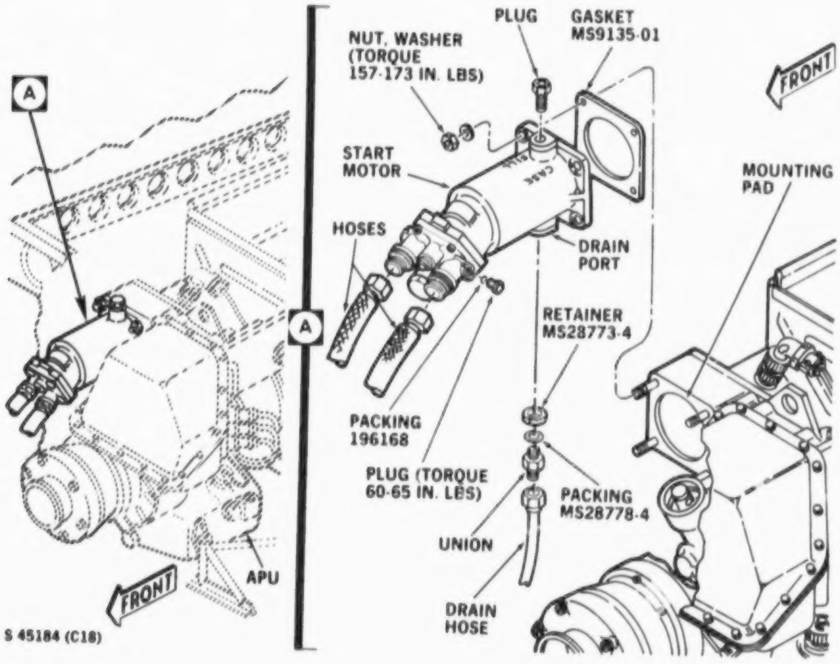

A
APU
FRONT
S 45184 (C18)
NUT, WASHER (TORQUE 157-173 IN. LBS)
PLUG
GASKET MS9135-01
FRONT
START MOTOR
MOUNTING PAD
HOSES
DRAIN PORT
A
RETAINER MS28773-4
PACKING 196168
PLUG (TORQUE 60-65 IN. LBS)
PACKING MS28778-4
UNION
DRAIN HOSE

FIGURE 15-12

15-4.5 REPLACE START MOTOR 15-4.5

INSTALL

j. Turn off all electrical power.

k. Lubricate packing, MS28778-4, retainer, MS28773-4, and union threads with petrolatum, Item 259, Appendix D.

l. Install packing on union and thread union into start motor drain port.

m. Remove plug from CASE FILL port on start motor. Fill motor completely with hydraulic fluid, Item 174, Appendix D. Install plug in CASE FILL port.

NOTE

For arctic operation, -29°F (-34°C), use Item 172, Appendix D hydraulic fluid.

n. Install gasket, MS9135-01, on start motor mounting pad.

o. Lubricate motor coupling shaft with grease, Item 163, Appendix D.

p. Install start motor on APU with washers and nuts. **TORQUE NUTS TO 157 - 173 INCH-POUNDS.**

q. Unplug and connect drain hose to union on start motor.

r. Remove caps from PRESS and RETURN ports on start motor. Unplug and connect hoses to PRESS and RETURN ports.

s. Remove tag from APU start valve.

t. Manually operate APU start valve in cabin midsection overhead to motor APU (PARA 7-5).

u. Check start motor for leaks. If leakage is found, make sure hose connections are properly tightened.

v. Do an operational check (TM 55-1520-237-T).

w. Make sure compartment areas are free of foreign objects.

x. Close and latch APU compartment door.

15-4.6 REPLACE SPLINE ADAPTER 15-4.6

REMOVE

a. Loosen clamp bolt on QAD mount clamp and remove generator from mount.

b. Move and support generator only far enough to get to spline adapter.

CAUTION

Do not hammer or tap spline adapter, as this may damage APU.

NOTE

A damaged spline adapter can be seen only after the generator has been removed.

c. Remove spline adapter using puller.

d. If splines in output drive gear are damaged, replace APU.

e. Remove any broken pieces of spline adapter using machinist's scribe.

INSTALL

CAUTION

Do not hammer or tap spline adapter, as this may damage APU.

f. Press tapered end of spline adapter onto output drive gear splines with pusher/puller and 7/16-inch socket.

g. Recess face of spline adapter up to, but not more than 1/8-inch, from APU output drive spline front face.

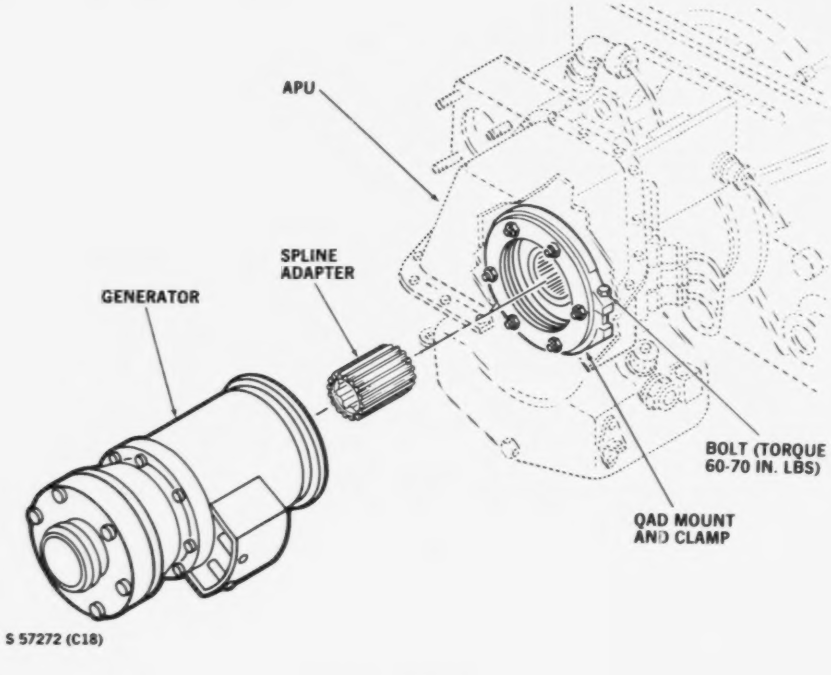


FIGURE 15-13

15-4.6 REPLACE SPLINE ADAPTER 15-4.6

h. Make sure area is free of foreign objects.

i. Coat groove in QAD mount clamp with a light coat of antiseize compound, Item 78, Appendix D.

j. Coat generator drive spline with grease, Item 169, Appendix D.

CAUTION

- To make sure of positive QAD mount clamp engagement completely around generator flange, support generator flush against QAD mount while tightening clamp bolt. Failure to do so can result in cracks in generator housing and flange damage.
- Make sure generator drive spline properly engages drive spline adapter of APU, to prevent pushing adapter out of drive spline and into gear box.

k. Place generator flat against QAD mount surface. Turn generator to position wires and terminals in lower right quadrant.

NOTE

The generator drive shaft will float in its support to allow for normal misalignment during installation. The shaft may be offcenter up to 1/16 inch, making it appear that it is bent, or not lined up. The shaft will center itself with the APU drive when the generator is installed.

l. Check clamp for proper engagement with generator and QAD mounting flange. **TORQUE CLAMP BOLT TO 60 - 70 INCH-POUNDS.**

m. Tap lightly around clamp circumference with mallet. **RETORQUE BOLT TO 60 INCH-POUNDS.**

n. Continue tapping clamp until two successive trials show no loss in torque reading from 60 inch-pounds.

o. Lockwire, Item 198, Appendix D, clamp bolt after making certain generator is properly attached.

15-5 AUXILIARY POWER UNIT (APU) FUEL SYSTEM 15-5

PARAGRAPH BREAKDOWN

15-5.1	PRIME APU FUEL LINE
15-5.2	REPLACE FUEL SHUTOFF VALVE

INITIAL SETUP

PERSONNEL REQUIRED

- One: MOS 67T - Tactical Transport Helicopter Repairer
- One: - Assistant

MATERIALS/PARTS

- Antiseize Compound, Item 78, Appendix D
- Protective Plug

TOOLS

- Aircraft Mechanic's Tool Kit, SC 5180-99-CL-A01
- Rags

REFERENCES

- TM 55-1520-237-T
- PARA 2-23
- PARA 2-32
- PARA 17-2

15-5.1 PRIME APU FUEL LINE 15-5.1

PRIME

a. Unlatch and hinge open APU compartment door.

b. Loosen stud fasteners, or remove screws, securing fuel control cover to fuel control base. Remove cover.

CAUTION

To avoid damage to fuel filter, union inside fuel control base must be held with a wrench when loosening or tightening fuel inlet hose.

c. Holding union inside base with a wrench, loosen B-Nut on fuel inlet hose at fuel control enclosure inlet enough to let fuel leak when priming fuel inlet hose.

d. Place BATT switch on upper console ON, or connect external electrical power to helicopter.

WARNING

To prevent injury to personnel or damage to equipment, make sure APU T-handle on upper console is not pulled out.

e. Hold rag around fuel hose B-nut. Have assistant place FUEL PUMP switch on upper console in cockpit to APU BOOST. When fuel leaks from B-nut, tighten B-nut and place FUEL PUMP switch OFF.

f. Place BATT switch on upper console OFF, or disconnect external electrical power from helicopter.

g. Make sure area is free of foreign objects then close and latch APU compartment door.

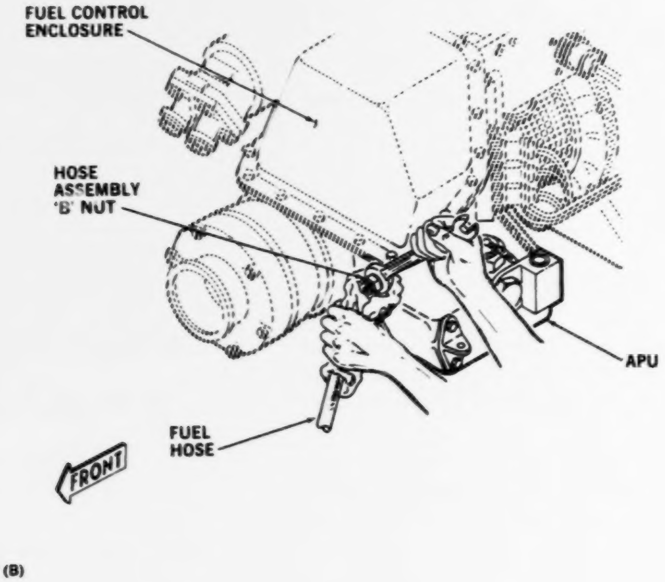


FIGURE 15-14

15-5.2 REPLACE FUEL SHUTOFF VALVE 15-5.2

REMOVE

a. On UH-60A helicopters, do this:

  (1) Remove troop seats from rear cabin (PARA 2-23).

  (2) Remove soundproofing blanket from right stowage compartment in cabin midsection (PARA 2-32).

  (3) Unhook cargo netting to get into compartment.

b. On EH-60A helicopters, do this:

  (1) Remove right panel on rear cabin bulkhead (PARA 17-2).

  (2) Remove access panel on right panel enclosing fuel system components.

c. Unlock fastener studs holding right panel enclosing fuel system components on top of fuel cells. Remove panel from compartment.

d. Turn off all electrical power.

e. Disconnect electrical connector from fuel shutoff valve.

f. Disconnect fuel hose from fuel shutoff valve, and plug hose.

g. Hinge open APU compartment door.

h. Place some rags on transition deck around fuel hose. Disconnect fuel hose from shutoff valve union protruding through deck. Plug fuel hose.

i. With assistant inside helicopter holding fuel shutoff valve, remove nut, insulated washer, and valve from transition deck.

INSTALL

j. Fasten fuel shutoff valve to transition deck with insulated washer and nut, using assistant to hold valve in place.

k. Coat threads on fuel shutoff valve unions with antiseize compound, Item 78, Appendix D.

l. Unplug fuel hose and connect to fuel shutoff valve union.

m. Connect fuel hose to fuel shutoff valve.

n. Connect electrical connector to shutoff valve.

o. Prime fuel line (PARA 15-5.1) and check for leaks.

p. Do an operational check of fuel prime boost system (TM 55-1520-237-T).

q. Remove rags from APU compartment.

r. Make sure area is free of foreign objects then close and latch APU compartment door.

s. Make sure area is free of foreign objects then install right panel enclosing fuel system components. Lock fastener studs.

t. On UH-60A helicopters, do this:

  (1) Hook cargo netting in stowage compartment access opening.

  (2) Install soundproofing blanket (PARA 2-32).

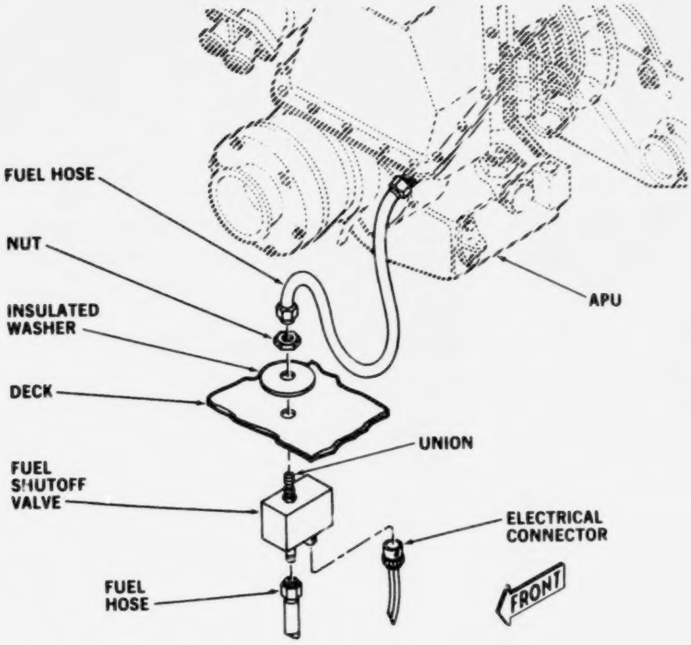
  (3) Install troop seats (PARA 2-23).

u. On EH-60A helicopters, do this:

  (1) Install access panel on right panel enclosing fuel system components.

  (2) Install right panel on rear cabin bulkhead (PARA 17-2).

15-5.2 REPLACE FUEL SHUTOFF VALVE 15-5.2


FUEL HOSE
NUT
INSULATED WASHER
DECK
UNION
FUEL SHUTOFF VALVE
ELECTRICAL CONNECTOR
FUEL HOSE
APU
FRONT

S 45168 (B)

FIGURE 15-15

By Order of the Secretary of the Army:

CARL E. VUONO
General, United States Army
Chief of Staff

Official:

WILLIAM J. MEEHAN II
Brigadier General, United States Army
The Adjutant General

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6	2-1 a			In line 6 of paragraph 2-1a the manual states the engine has 6 Cylinders. The engine on my set only has 4 Cylinders. Change the manual to show 4 Cylinders.
81		4-3		Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.
125	line 20			I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

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COMMANDER
U S ARMY AVIATION SYSTEMS COMMAND
ATTN: AMSAV-MMD
4300 GOODFELLOW BOULEVARD
ST. LOUIS, MO 63120-1798

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN. . JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT. FOLD IT AND DROP IT IN THE MAIL'

SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 55-1520-237-23-5	29 Aug 89	AVUM and AVIM for Army UH-60A and EH-60A Helicopters

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO	IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME GRADE OR TITLE AND TELEPHONE NUMBER

SIGN HERE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS

TEAR ALONG PERFORATED LINE

FILL IN YOUR
UNIT'S ADDRESS

FOLD BACK

DEPARTMENT OF THE ARMY

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C